ELECTRICAL REVIEW

February 14, 1947

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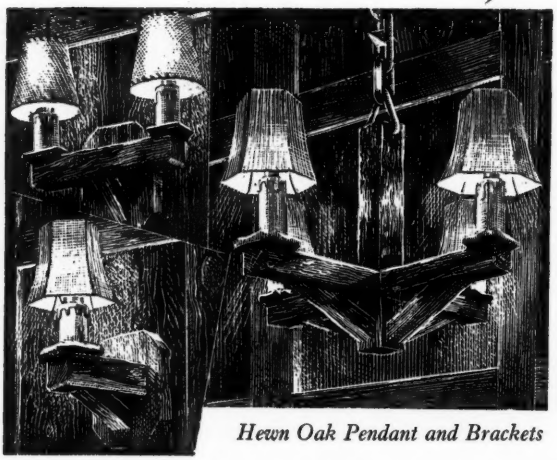

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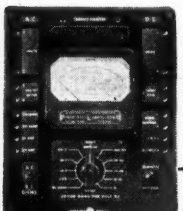

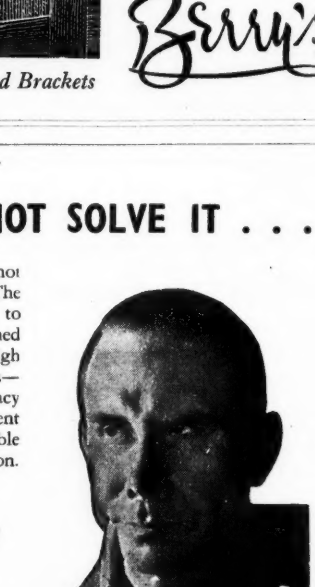

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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The Shut-Down

Effects of Emergency Measures

PERSISTENCE of very severe weather has brought about the dislocation of electricity supply which has long been foreseen. For about three weeks frost and snow have hampered coal production and transport until power station stocks, already on a hand-to-mouth basis, have been almost exhausted. This has led to the decision of the Minister of Fuel and Power to restrict domestic supply and cut off power from industry altogether in certain areas.

There has been much recrimination, but the responsibility both for coal shortage and lack of generating plant (referred to later in this issue) dates back to wartime. Whether the present Government has done all that it might have done to prevent the present situation developing is debateable. In any event this country cannot survive unless its industries are assured of fuel and power and if more effective measures are not adopted before next winter there may be complete collapse.

Panic Decision

The expedients introduced this week to keep the larger power stations running are obviously of a "panic" nature. Something had to be done to prevent the complete breakdown of the electricity supply system, but the measures suddenly put into force have raised great problems. In many areas, particularly London, small industrial and domestic premises are too frequently on the same feeders to ensure either that industries shall not use electricity during the "permitted hours" for domestic consumers or that domestic consumers shall not take the supply from a feeder which is also serving an essential service during the hours of restriction.

In consequence of this a number of undertakings announced that it was impossible to comply with the Ministry's instructions, and Birmingham (among others) decided not to attempt to discriminate. In this and other areas reliance has been placed upon the commonsense and goodwill of the consumers.

Responsibilities on Consumers

The Ministry itself realized that this would happen, although it evidently did not think that segregation would be so difficult as it has turned out to be. It was certainly realized that compulsory measures, if at all possible, could not be introduced in a day. Thus we are left in the position that the success of the scheme depends almost entirely on voluntary action. The extreme gravity of the situation has been so impressed upon the public that good results may be expected.

Another matter to which attention

SUSPENSION OF PUBLICATION

In common with all weekly periodicals there will be a temporary suspension of publication of "Electrical Review" after this issue. Agreement to this effect has been reached with the Ministry of Fuel and Power to help in the present fuel and electricity crisis. It is expected that the suspension of publication may continue for two consecutive weeks.

should be drawn is the almost complete absence of exhortation to gas consumers to economize. The stress has been on electricity alone, although the gasworks are large consumers of a better quality of coal than electric power stations. Endeavours to secure from the Ministry some reason for it have failed to secure a satisfactory answer.

Estimates of the number of people stood off from industry vary between three and five million, an extremely serious matter for the country at the present time. The winter is not over yet and the Government must devise better methods for getting safely through the next month or two. It must also do more than was done last year to build up stocks during the summer so that electricity supply, the lifeblood of industry, shall be secure next winter.

Coal Output and Consumption

DECEMBER saw a further slight improvement in coal production when the average weekly total was 3·6 million tons as compared with 3·4 million tons in December, 1945. The output per man-shift rose from 1·01 to 1·04 tons. Unfortunately consumption was still ahead of production, further depleting stocks. In the case of electricity undertakings the weekly usage was 626,000 tons, against 528,000 tons in December, 1945, and by the end of the month stocks were down to 1·6 million tons (2·7 winter weeks' supply) from the December 31st, 1945, figure of 2·9 million tons (5·1 weeks' supply).

Inferior Apparatus

WE agree with Mr. L. C. Penwill, director of the Electrical Contractors' Association, that Mr. Shinwell was too comprehensive in his condemnation of the sellers of electrical appliances. He should have made it clear that his strictures did not apply to reputable electrical retailers. We are also with Mr. Penwill when he suggests that action in this matter is somewhat belated and should have been taken by Mr. Shinwell's colleagues long ago. The methods by which it is now proposed to curtail the supply of unsafe and shoddy equipment are perhaps the wrong way of going about it but it does represent an endeavour to clear up an unsatisfactory situation. If it is not the Minister's intention to put private retailers out of business his action should operate to the honest retailers' advantage.

"Profits" and the Exchequer

ASKED by Sir Thomas Moore whether some of the immense profits of the Post Office should not be passed on to the public (presumably in the form of lower charges), the Assistant Postmaster-General said that the finance of the Post Office could not be dissociated from the national finance as a whole. If this means anything it is a declaration that Post Office profits may be paid over to the Exchequer. This is one of the unpleasant possibilities always inherent in nationalization and there is no safeguard against the same thing happening in the case of electricity supply. We have always objected to rate relief from electricity funds; will we in future have to protest against tax relief at the expense of the electricity consumer?

The Faraday Lecture

ADDITIONAL interest was lent to the first annual function last Saturday of the I.E.E. Southern Centre since its inauguration on March 12th last year by making it the occasion of the initial delivery of this year's Faraday Lecture. The subject chosen by Mr. J. Hacking was well suited to a largely non-technical audience desirous of being informed by a leading authority, in a manner that was free from political bias, of the causes that have led to the necessity for recent load-shedding and the prospects for the future of electrification generally.

Volumes and Values

SATISFACTION with the rising value of exports is tempered by the consideration that, owing to price changes, the volume is not proportionately greater. But care should be exercised in employing this generalization, for overall volume may be a very deceptive guide to progress and it is impossible to apply a price coefficient to the whole of our exports or even to exports in a particular section. It may easily be that changes in the nature of the trade have taken the form of increased exports of lighter, more intricate, apparatus which is of greater value to the country than an equivalent rise in the tonnage of heavy plant. It represents the export of brains and skill rather than just processed materials.

Increasing Popularity of Electrical Methods

PROBABLY even more striking than the widespread adoption of electrical methods for milling the raw materials for pottery and for undertaking the numerous other processes in the formation of china and earthenware (see previous articles, October 11th, 1946, and January 17th, 1947) is the increasing use of electricity for firing purposes. This has developed particularly during and since the war and to-day much of the heat-treatment plant now being installed in the Potteries is electrically fired.

There are numerous reasons for this, but probably the ability to produce high-class ware of more uniform quality is the one which has the strongest appeal to pottery manufacturers, who even in the present "sellers' market" realize the necessity for raising their standards not only for export but for home sales as well. The exceptional simplicity and precision of heat control of the electric kiln, with its automatic and safety features renders the firing operations practically foolproof. Maximum temperatures can be kept to within 2 or 3 deg C of the standard and the fireman's job becomes a matter of routine rather than skill.

Especially do the advantages of electrical methods become apparent when dealing with the more delicate colourings. Not only are the temperatures that must be used extremely critical, but there is risk of contamination if gas, oil or solid fuel is used. No such danger exists in the electric kiln, the atmosphere of which is essentially clear and free from sulphur. The absence of smoke, dirt and fumes also greatly improves the working conditions for the operator and makes it possible to establish factories in rural surroundings without spoiling the countryside. Incidentally, except for the question of the availability of skilled labour, there is now no reason why the industry should remain tied largely to the North Staffordshire area, which was originally selected mainly for the proximity of coal and the type of clay used for making the saggars (containers used in the firing), which in electric firing are no longer required.

The coal shortage and the necessity for making the most of the available resources are further strong arguments for the adoption of electricity. The principal considerations were outlined by Mr. Thomas Lockett, O.B.E., general manager of the Stoke-on-Trent Electricity Department, and Mr. L. Bullin, B.Sc., technical manager of Richards Tiles, Ltd., in a paper read at the Ministry of Fuel and Power Conference on "Fuel and the Future" last October.

Emphasis is laid in this paper on the fact that a higher thermal efficiency in the kiln itself can be achieved with electricity than in any other fuel owing to the following facts:—(*a*) The electric kiln lends itself better to heavy insulation than any other type and so reduces the generally high radiation and convection losses from walls and roof; (*b*) In electric

firing no air is necessary for combustion and the exhaust gas and excess air losses are cut out: only in the biscuit tunnel is a small amount of air needed to take away the free and combined water from the clay and the small volume of CO_2 from any carbonaceous matter in the body; (*c*) the atmosphere of the electric kiln being perfectly clean there is no need for protection by saggars: all the goods are placed quite open and the supports can be on more slender lines than for other forms of firing, so that a very high packing density for ware can be achieved and the ratio of weight of ware to weight of supports can be considerably increased.

An actual example forcibly brings home this last-mentioned advantage. In gas-fired earthenware glost tunnel ovens of the open-flame type the ratio of weight of ware to weight of supports is approximately 1 : 3. In the electrically-fired glost oven it is nearer 1 : 1. This means that if the thermal efficiency of the electric oven is 1½ times that of the gas-fired then the ware efficiency will be three times as great. In fairness to gas-fired ovens it must of course be said that quite a number of plants of the muffle type have the truck structure similar to that of the electric ovens (i.e., without saggars) and that the ratio of weight of ware to weight of supports is correspondingly nearer to the 1 : 1 ratio of the electric ovens.

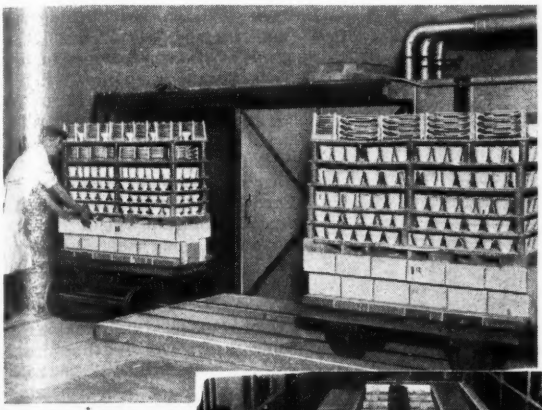
A further great advantage of the electric kiln, of special importance in view of the overcrowding of plant prevalent in the potteries, is that no provision has to be made for extracting the heat from waste gases and therefore, generally speaking, the kiln can be built shorter than would be the case if gas were used.

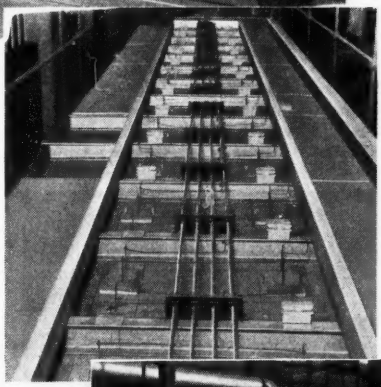
Apart from its higher thermal efficiency the electric oven scores again in securing a reduction in labour costs. What work there is is comparatively light, consisting almost entirely of placing the ware on its supports: there are no heavy saggars to lift about. With the tunnel type of oven sufficient trucks can be placed during the day shift to last twenty-four hours.

It is almost exactly twenty years since the first commercial electric kiln was installed, at the works of Mintons, Ltd. As might be expected, this was of the decorating or "enamelling" type which, requiring a maximum temperature of only about 760 deg C, presented no especial difficulties in the design of the elements. About two dozen of these kilns are now giving eminently satisfactory service at potteries all over North Staffordshire.

For decorating purposes the circular type of kiln such as the "Rotolec" model at the Paragon Works is now very popular

The original electrically-fired decorating kilns were of the straight tunnel type, through which trucks carrying the ware travel on rails. We were shown a typical example of these at J. & G. Meakin's Eagle Pottery. Installed by G.W.B. Electric Furnaces, Ltd., in 1930 and since lengthened and heightened, it is 110 ft long and accommodates twenty trucks 4 ft 4 in. long, 1 ft 6 in. wide and 2 ft 11 in. high. Pushing gear, driven by a 1-H.P. motor through a 4-speed cone, moves the trucks in the kiln one truck length in 1 hr, 40 min, 35 min, or 30 min, according to the quantity and type of pottery being dealt with, the whole journey of a truck therefore taking 20 hr, 13 hr 20 min, 11 hr 40 min, or 10 hr.

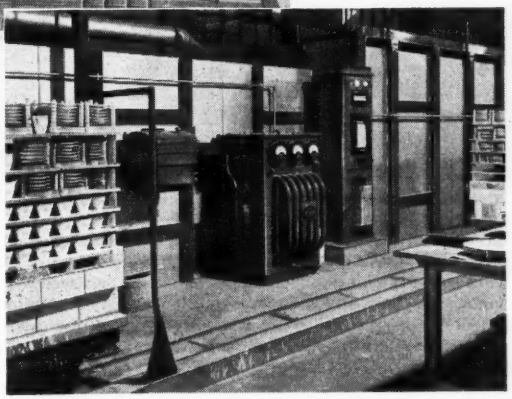




New glost oven at the Paragon Pottery. Above: Admitting a loaded truck. Right: Bus-bar system along the top of the oven. Below: Control equipment

This kiln is employed mainly for overglaze work but at weekends it is used for hardening on. The temperature in the firing zone is approximately 700 deg C, and in the pre-heating and intermediate zones they are respectively 365 and 570 deg C, though these temperatures can be varied according to the type and colours of the decorations being fired. With a maximum demand of 80 kW the nickel-chromium heating elements, which are in the form of 1¼-in. diameter helices 6 ft 2 in. long, are supported on smalle diameter "Sillimanite" tubes, which are in turn supported on slotted protrusions on the inside of the kiln, in such a way that they are free to expand, are totally unmasked and can radiate in all directions. Seventeen metal-clad switch-fuses control various banks of elements, the exact temperature required in the kiln being achieved roughly by means of a voltage-regulating transformer and finally by a Cambridge regulator, provided with a three-point recorder The regulator operates a contactor which connects additional elements into circuit on fall in temperature. Extract ducts take away the volatile oils immediately before the pre-heating zone.

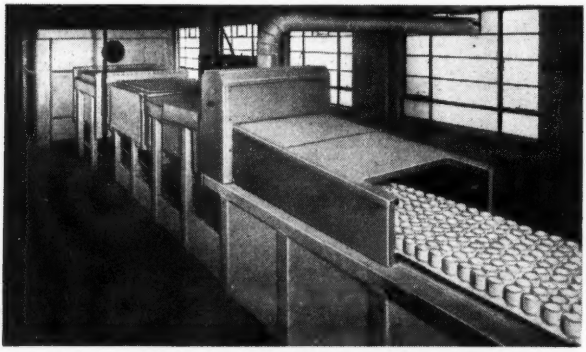
To conserve heat and



so save electricity, another development has been the arrangement of a pair of ovens side by side, the trucks travelling on adjacent parallel tracks in the same tunnel. By this means there is a considerable amount of heat exchange at the two ends of the tunnel, while the area of outside walls, where radiation and convection losses take place, is considerably reduced.

One of these twin kilns which we inspected at the Doulton Works has been in successful use for nineteen years for firing " on glaze " decoration, particularly of the well-known " Doulton Ladies " and other figures, the fine control of temperature obtainable being especially suitable for dealing with the delicate colourings employed in this class of work. The kiln, which was made by the Electric Resistance Furnace Co., accommodates twenty-four trucks, 4 ft 6 in. long by 1 ft 3 in. wide by 2 ft 5 in. work space. The maximum operating temperature is about 840 deg C, the trucks being changed at each end every 50 minutes.

The nickel-chromium heating elements which have a total loading of 115 kW, are arranged horizontally in grooves in the walls and are connected in star formation, some in series and some in parallel. Control of temperature by means of three 35-kVA B.E.T. auto-transformers with tappings is supplemented by fine automatic regulation by means of a Cambridge regulator used in conjunction with an Allen West contactor to cut off various sections of the elements.



Continuous conveyor type glost and biscuit oven at the Leighton Pottery

For decorating purposes these straight types of tunnel kilns have to some extent been superseded by the circular tunnel type, especially where space is restricted. This design provides for the loading and unloading to be carried out from the same position, a rotating table carrying the ware being driven slowly through the tunnel by means of a small motor (about 1 H.P.) operating through a gear box and rack and pinion. Regulation of the firing times between 12 and 24 hr (the average time required is about 16 hr) is generally obtained by means of 4-speed cones.

Individual types of these circular kilns differ slightly in detail but a typical unit, a G.W.B. " Rotolec " kiln, at the Paragon Works designed to handle 3,500/4,000 dozen of china dinner and tea ware a week, has a rotating table just over 22 ft in diameter and 1 ft 4 in. wide, the loading height being 2 ft 4 in. Elements with a maximum loading of about 60 kW are arranged horizontally, inside the side walls for about one-half of the extent of the tunnel, the unheated portions nearest the ends being utilized for initial warming and cooling respectively. Three heating zones are provided. The first, or preheating zone, is equipped with three pairs of heating elements to give a temperature of about 300 deg C. The second or centre zone with a temperature of 400–500 deg C has six pairs of coils, while the third or firing zone operating at 800 deg C is provided with eight pairs.

The temperature in each zone is regulated roughly by connecting the elements either in series or parallel between each phase and neutral of the four-wire supply. Fine control is effected by means of an Electroflo indicating controller and three-point recorder, operating in conjunction with a contactor which switches on or off a certain number of the elements.

Further control of the kiln temperatures is obtained by the incorporation of the Gibbons " Controvec " system which is also claimed to save about 20 per cent in electricity consumption. By this arrangement currents of low-velocity air taken from the kiln at the exit end are blown, by means of a motor-driven fan, into the top of the kiln several feet away towards the firing zone, the air flow

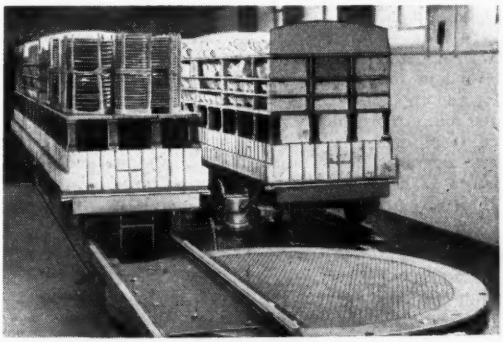
being regulated by means of dampers inserted in the ducts.

This scheme very effectively counteracts the flow of hot air currents which in tunnel kilns tend to flow from the hot zone to the end zones and cause unnecessary heat loss, besides retarding the cooling of the ware. Provision is made for adjustments to be made to cover changes in atmospheric conditions. In decorating kilns an extract duct with damper control is fitted near the admission end to draw off the volatile oil fumes.

As manufacturers are able to overcome the present shortage of pottery and get away from the production of utility ware, the amount of decorating to be done is certain to increase considerably and already the more farsighted firms are arranging for the installation of any additional plant that may be necessary. In view of the higher temperatures for firing glost (1,050–1,100 deg C) and biscuit (1,100–1,200 deg C for earthenware and 1,250–1,350 deg C for china) the extension of the use of electricity to cover these processes has inevitably been slower, involving as it does the development of special types of elements. Nevertheless by 1939 the stage had been reached when it was practicable to put into commercial operation, at Messrs. Wedgwood's works at Barlaston, an electric tunnel oven for firing earthenware biscuit and glost up to a maximum temperature of 1,140 deg C. This plant, described in detail our issue of May 2nd, 1941, also provides another interesting application of double-oven arrangement, the biscuit and glost ware being treated in parallel tunnels, the trucks travelling in opposite directions.

About the same time as this plant was installed further developments in element construction made it possible to produce ovens with temperatures of around 1,150 deg C, sufficiently high for firing the finest types of china glost. Two of these installations, one carried out by Major Bernard J. Moore and the other by G.W.B. Electric Furnaces, Ltd., were described in the *Electrical Review* of March 19th, 1943, and February 11th, 1944.

Both of these units are of the continuous tunnel type and a number of similar ovens have been installed since. One of the latest installations is at the Paragon Works, where an improved version of the G.W.B. unit has recently been completed. Here a 119 ft 6 in. tunnel accommodates twenty-five trucks 4 ft 6 in. long by 1 ft 6 in. wide by 2 ft 6 in. loading height. Though a temperature of over 1,150 deg C is obtainable, about 1,080 deg C is normally found sufficient.



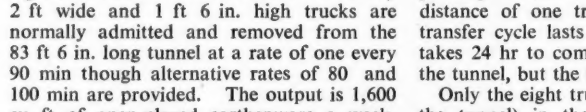
New twin tunnel glost oven at the Doulton Works, showing turntable arrangement

Forty-eight elements of 0·08 in. diameter 80/20 nickel-chromium wire are located vertically in the sides of the oven, the removal of two bricks at the top permitting the elements to be replaced while the oven is in operation. Solid ½-in. copper bus-bars are run along the top of the oven.

During heating up, the maximum loading of 150 kW was employed but normally 120 kW is sufficient. The 150-kVA E.C.C. transformer provided has seven tappings giving 415/435-334 V, the tap-changing handwheel being interlocked with the Ellison main circuit-breaker. In addition a Brookhirst contactor is employed with an Electroflo temperature indicating controller and three-point recorder. This oven is also fitted with Gibbons' improved "Controvec" system which provides for air to be drawn between the kiln structure and the outer steel casing from the exit end towards the admission end by a 2-H.P. motor-driven fan, through filters and ducts and then into the top and sides at both ends of the oven. The inflow is regulated by dampers in the ducts, so enabling the temperature cycle to be further adjusted. The pushing gear is arranged to give a 21-24 hr cycle of operations.

Another recent glost oven installation of the same make, at Wiltshaw & Robinsons' Carlton Works, differs in a number of details. The elements are arranged horizontally in

four banks, and although no facilities are provided for changing them while the oven is in use, sufficient spares are available to ensure uninterrupted operation for a long period. In any case the average life of an element used for glost work is at least eighteen months. The seventeen 4 ft 6 in. by 2 ft wide and 1 ft 6 in. high trucks are normally admitted and removed from the 83 ft 6 in. long tunnel at a rate of one every 90 min though alternative rates of 80 and 100 min are provided. The output is 1,600 cu ft of open-placed earthenware a week. The operating temperature of the oven is about 1,000 deg C, the power input being 75 kW. An electric oven for biscuit is also to be installed at the Carlton Pottery.



Control panel for twin-tunnel glost oven at the Doulton Works

A further application of the twin-tunnel arrangement has been adopted for another type of glost oven just completed by the International Furnace Equipment Co., Ltd., at Doulton & Co.'s works. Here the elements instead of being attached to the inside of the walls are actually on the trucks themselves. Supported on very light Sillimanite bricks, the elements, which are of ½-in. 80/20 nickel-chromium strip 0·1 in. thick, are run, caterpillar-like, up and down the trucks lengthwise in twelve rows, the ware being placed on trays supported on pillars just higher than the elements. There is 18 in. of placing height, the trucks being 6 ft long and 2 ft 6 in. wide.

The oven is 73 ft long and accommodates twelve trucks in each side. In addition the rails are extended three truck-lengths at each end to connect with turntables. Trucks are automatically introduced into and ejected from each end of the oven alternately every 90 min, bells and amber and red lights indicating when the transfer is about to commence. As soon as the turntables have completed a half-circle, a piston mechanism is set into operation and on reaching its full extent hooks on the bottom of the truck and gradually pulls it towards the tunnel, thereby pushing all the other trucks along for the distance of one truck length. The whole transfer cycle lasts 8 min, and each truck takes 24 hr to complete its journey through the tunnel, but the time can be adjusted.

Only the eight trucks (four in each side of the tunnel) in the firing zone have their elements in circuit (by means of conductor rails) and each one has its temperature separately regulated by means of radiation pyrometers, "high-low-off" regulators and 3-position contactor gear with tapped transformers giving 10-V steps from 30 to 100 V. The normal temperatures at which the four trucks in each line operate for earthenware are, respectively, 950, 1,020, 1,020 and 1,020 deg C, with higher temperatures for china glost ware. Six-point recorders show the temperatures in the pre-heating, firing and cooling zones, while coloured lights indicate whether the temperature of each truck is normal, high or low.

To ensure uniform temperature, compressed air at a pressure of 100 lb per sq in. can be introduced through forty fused alumina jets located at the sides and top. With the aid of deflector plates, the former cause horizontal currents of air while those at the top form cross-currents vertically. Other jets of nickel-chromium accelerate heat exchange between the pre-heating and cooling zones of the adjacent tunnels.

Yet another type of glost oven, which has also been used satisfactorily for biscuit work, has recently been installed at the Leighton Pottery, Burslem, and following its successful operation several others are already on order. This unit has a large output from a relatively small floor area, a production of 7,000 dozen of assorted tableware being obtained per week of 168 working hours from a plant measuring only 68 ft by 9 ft the output is about half the above figure for biscuit work.

One feature of this Birlec continuous tunnel unit is the use of an endless conveyor belt instead of trucks. This belt, which is 3 ft wide and is woven in mesh form from a special heat-resisting nickel-chromium alloy wire, passes over large diameter drums at either end and returns underneath the casings of the chambers. A patented self-regulating tensioning device for the drive keeps the stress on the belt to an extremely low value throughout the heated portion of the belt. The conveyor speed can be regulated from about 3 ft to 6 in. a minute, glost ware normally taking 2 to 2½ hr to pass through the tunnel. With the use of a conveyor belt there is of course no need for trucks, saggars or oven furniture, the ware being placed on $\frac{3}{16}$ in. thick Sillimanite bats. Despite the exceptionally short period of firing the ware has been shown to stand up satisfactorily to the normal crazing tests.

Sectional Construction

The cross-section of the tunnel is 3 ft wide by 12 in. throughout its length, except in the heating chamber where the dimensions are increased. The tunnel is made in sections comprising inlet section, heating chamber arranged in three zones, slow (air) cooling chamber, fast (water) cooling chamber and outlet section, the sections being joined continuously together. All sections are constructed in external steel casing which is supported where necessary to bring the floor of the tunnel to a height of about 3 ft above floor level to facilitate loading.

The heating elements constructed of a very heavy section 80/20 nickel-chromium alloy strip are mounted in sinuous formation in the roof of the heating chamber by the Birlec patented hook method and on the floor on refractory ceramic supports. The element supports are designed to expose vertically the entire surface of the strip for the free radiation of heat. The oven has operated for long periods at temperatures above 1,100 deg C without element trouble.

The heating elements, which cover the entire area of the roof and floor of the heating chamber, are divided into three zones. In the first the ware is pre-heated to about 1,020 deg C, in the second it is raised to the maximum temperature of about 1,080 deg C, while the third zone maintains the desired temperature up to the beginning of the cooling section. The total rating of the elements is 180 kW, about half of which is taken by the pre-heating zone, 60 kW by zone two and 30 kW by zone three. The total normal running demand is approximately 120 kW. The low voltage (about 100 V) required for the heaters is provided by a double-wound transformer for each section of elements.

Each zone is controlled automatically by a millivoltmeter pattern regulator which also serves as a temperature indicator. On/off control is provided by a motor-driven depressor mechanism engaging with the indicator pointer in each case. The regulator mercury switches control the heating element supply by means of triple-pole contactors on the primary supply to the transformers, while an oil-immersed iron-clad circuit-breaker isolates and protects the complete installation, overload relays being provided in each subsidiary circuit. Two Cambridge regulators are set for a maximum temperature of 1,180 deg C and arranged to trip the main circuit-breaker in the event of excess temperature. The oven is ready for use within two hours so that continuous operation over the week-ends is not necessary.

Application to Biscuit Firing

Now that the superiority of electricity for decorating and glost work has been established and manufacturers are beginning to turn their attention seriously towards its application to biscuit, it is only a matter of time before ovens are available with elements which will withstand the temperatures up to 1,350 deg C required for firing the majority of china biscuit. It is probable that the first of these high-temperature biscuit ovens will be in operation within the next year or so.

For their assistance in the preparation of this article we should like to thank Mr. Thomas Lockett, general manager of the Stoke-on-Trent Electricity Department, Mr. L. Goodall, his distribution engineer, Mr. H. McCartney, his technical assistant, and various representatives of G.W.B. Furnaces, Ltd., Birlec, Ltd., the International Furnace Equipment Co., Ltd., the Electric Furnace Co., Ltd., Paragon China, Ltd., J. & G. Meakin, Ltd., Wiltshaw & Robinson, Ltd., Doulton & Co., Ltd., and the Leighton Pottery Co., Ltd.

Scientific Policy.—Sir Henry Tizard is the chairman of the Advisory Council on Scientific Policy appointed by the Lord President of the Council. The members include Sir Edward Appleton, secretary, Department of Scientific and Industrial Research, and Sir Claude Gibb (C. A. Parsons & Co., Ltd.).

Views on the News

Reflections on Current Topics

I AM inclined to sympathize with the many who consider that the discussion of nationalization of electricity supply at the present time is unrealistic when all the Government's energies should be concentrated on providing coal and the necessary plant, both for electricity generation and for industrial production. With such a serious situation to cope with it seems like madness to swap horses in mid-stream, that is, to substitute State ownership for the present "set-up" of the electricity supply industry. With all the will in the world it is not easy for the present managements to carry on with single-minded intentness while under sentence of death.

* * *

Looking through the debate on the second reading of the Electricity Bill in *Hansard* I came across the following strange statement by Col. Sir Thomas Moore:—"The other electricity undertaking of which I have some knowledge is St. Marylebone. It was acquired from the Central Electricity Board some years ago for over £1,000,000." The Central Board is credited with too much. Another member, Mr. R. S. Hudson, said that the Board had set up the committee on tariffs, whereas it was appointed by the Electricity Commission. But, of course, it is very difficult for a layman to comprehend the separate duties of and relations between the two bodies.

* * *

The relationship between the I.E.E. Wiring Rules and the Codes of Practice is, I find, not always understood. Broadly speaking, the former are concerned with safety and are expressed in mandatory terms capable of precise definition. The Codes, while accepting the requirements of the Wiring Rules, go beyond questions of safety and enunciate acceptable standards of good practice and therefore take the form of non-mandatory recommendations. Electrical Codes are drawn up by a committee convened by the Council of the Institution of Electrical Engineers in response to an invitation of the Codes of Practice Committee—an organization set up after senior Institutions had approached the Ministry of Works to press for the codification of a wide range of technical practices concerned with building. The Ministry found accommodation and defrayed the office expenses of a secretariate to the Codes of Practice Committee which, while operating under the ægis of the Ministry, remains independent.

* * *

Those who strove to get mains supplies into factories in the days when industrialists were apt to compare unfavourably the price per kWh with that supposed to be obtainable with their steam engines, and to assume a plant load factor of 100 per cent for full rating in each case, will regret that the new Bulletin of the Ministry of Fuel and Power on Fuel, Power and Heat Costing was not available then. It would have provided some backing to their claim that costing should have a less crude basis than that adopted by some works managements. On that account I rather resent the suggestion in the Bulletin that the engineer is often prone to ignore completely obvious cost components, since he ought by definition to be well-versed in such matters. Even so he would gain by a study of the comparative tables and other matter given in this Bulletin.

* * *

One of the incidental additions to the cost of coal having a high proportion of "fines" receives attention in the annual report of the Chief Inspector of Alkali Works in a reference to grit emission from power stations. In one case, as there is believed to be no hope of improved quality, the undertaking proposes to incur the expense of providing more efficient cyclones and erecting an additional tall chimney. This work will take at least two years and in the meantime the unfortunate undertaking is likely to incur public odium for any pollution of the atmosphere in the vicinity.

* * *

In the *Electrical Review* of January 10th mention was made of the many notable events of a century ago that have been foremost influences in the development of electricity. Of these the birth of that great inventor, Thomas Alva Edison, the hundredth anniversary of which was celebrated on Tuesday, was certainly among the greatest. The enormous productivity of his versatile genius was exemplified in the 1,097 patents which he took out. —**REFLECTOR.**

Industry and the House

Where Are We Going?

By F. J. Erroll, M.A., A.M.I.E.E., M.P.

ONLY a supreme optimist, leaving England at the end of December 1946, could dare to hope that on returning early in February he would find the fuel situation in Britain changed for the better—and not least the efforts of the electricity industry to meet a greatly increased demand with inadequate and insufficient plant. Yet even a pessimist could scarcely have thought it would be so bad as I now find it after a month's visit to West Africa as a member of a Parliamentary Delegation.

To examine this situation in detail in this article would only be a repetition of what will be said more fully both elsewhere in this journal and in the national press. To attempt in retrospect a summary of the long and intricate debate on the Electricity Bill of nationalization would be to incur a similar charge of pointless reiteration.

I propose therefore in this article to attempt a different task: a marrying of these two themes, and an association with them of other recent pronouncements in the House, with a view to asking where we are going in this matter of electricity supply. Distressing as it was to return to this grim current situation I could have been philosophical had it seemed that it was a temporary situation only. It is true, of course, that the nationalization of the coal industry is too young as yet to have made any difference (one way or the other); that the mere granting of a second reading to a nationalization Bill for electricity supply cannot be expected to solve overnight the accumulated problems of six years and more of inevitable postponement; that the weather has been calamitous enough to make things difficult for any Government. . . . Granting all these things, even though I am a member of the Opposition (it would be unreasonably partisan to do otherwise), I am yet seriously perturbed for the future.

Coal or Plant?

First, generation itself. The Government seems uncertain still whether it is shortage of plant or of adequate coal that is mainly to blame for the present cuts. Mr. Shinwell has more than once told the House that the latter has had nothing to do with it, and only in his sobering statement last Friday did he say the plight of the power stations was "entirely attributable to the short haul we have experienced in the past week." No doubt that was the explanation but the earlier inabilities of the power stations to meet demands had been ascribed wholly to the unsatisfied demand for new plant.

On January 23rd he agreed there was "some substance" in the statement by Sir Arnold Gridley that "if the coal mines were in a position to supply the class of coal for which the power stations and boiler houses were designed, the existing plants in those stations would be in a position to supply another 400,000 H.P. at the peak load, and thus diminish the amount of shedding which has had to be done." But the real point is: what is going to be done about it?

Minister and Board

On January 30th, Mr. Shinwell assured Mr. Butcher and Mr. Assheton that it was the intention of the National Coal Board to ensure that everything possible was done to improve standards of quality. It is not my wish or intention to prejudge the efforts of the Coal Board to discharge its unenviable task, but do the efforts of the Minister to shelter its operations from criticism hold out sufficient hope that it will succeed in this particular respect? Mr. Shinwell, I believe, is right, having given the Board the responsibility for administering this great industry, to leave it free to get on with the job and not to encourage detailed interference by Parliament with problems of day-to-day management. At the same time he is showing all too ready a tendency to reply to every question on the work of the Board that this is a matter for the Board and, by inference, is no business of the House.

This would be less serious were the domestic and industrial consumers—the electricity industry prominent among them—to be given an adequate opportunity of ventilating their views outside the House. Unfortunately the proposed Consumers' Councils will be merely "stooges" removable at the Minister's pleasure. As Mr. Boyd-Carpenter pointedly observed, "If they are intended to be a reality, they must have independence

and authority to enable them to stand up to the National Coal Board, and the National Union of Mineworkers, and even the right hon. gentleman himself."

Rather more specific was Mr. Shinwell's estimate of the rate of increase in generating capacity. In answer to Commander Galbraith, he stated that additional capacity available for the public supply would be 2,600,000 kW by the end of 1949, 4,460,000 kW by the end of 1950, and 5,660,000 kW by the end of 1951. "These increases," Mr. Shinwell added, "will not be sufficient to meet the increase of electricity demand until the winter of 1950-51, but should then be sufficient, provided certain obsolete plant is still kept in commission." And providing also, no doubt, that the coal then being supplied is of reasonable quality!

What Will the Bill Achieve

Coming now to the supply end, what hopes can there be that as a result of the passing of this Bill a better and cheaper service will be provided? What is there in the Bill itself or in the Minister's speech to encourage the belief that developments will occur which would not have occurred without nationalization? It will, says Mr. Shinwell, enable a rationalization of methods of charging, and standardization of systems of supply and of type and design of plant and appliances to be carried out. But was nationalization necessary to bring about these things?

The Government apparently believes that more efficient management will result from the setting up of fourteen area boards. It is right, I believe, in granting to the boards "freedom to carry on their detailed work without reference to the Central Authority"; for the essence of good management is decentralization. But where, in the Bill or the speech, is the authority for believing that fourteen boards is the right number to secure the best administration? The Electricity Commissioners in 1937 proposed thirty districts divided into seventy-six groups.

Again, the policy of the boards, according to the Bill, will be directed to securing the cheapening of supplies "so far as practicable." Perhaps it will. But, as Commander Galbraith said, there was not one word in the Bill or in the speech of the Minister as to how it was going to be done.

Mr. Shinwell expects much from the authority given to the Central Authority to manufacture plant and fittings and the power of the boards to sell, hire or install them. Underlying this clause is the inference that hitherto the manufacturers have not discharged their responsibility adequately, and Mr. Shinwell apparently believes it has not been for the public good that there has sometimes been the closest relationship between manufacturers and supply companies. Yet he now proposes to set up a relationship even closer! If the boards live up to his promise that only appliances of the best quality will be sold or installed, the public may indeed benefit. But what safeguard, as Viscount Hinchingbrooke has asked, will there be against the proceeds of an unnecessarily high tariff being diverted to the manufacturing side of the Central Authority to secure commercial advantages for it against its competitors?

Finally how much better will the nation be served as a result of the introduction of the Bill at this crucial stage? To answer that question I should like to conclude by giving, without comment, two further extracts from the debate. First, Sir Arnold Gridley: "No industry has been, or is to-day, more efficient, more progressive, or has spent so many millions of capital on its development. No other industry has had happier relations with its employees, and no other industry has given its customers such benefits in reduction of prices, in spite of the very heavy rise in costs."

Dissipation of Energies

Second, Commander Galbraith: "The normal development of the electrical resources of our country has been halted as the result of six years of war, and there is a great deal of leeway to be made up. Coal is short—almost at famine level—and that has led to an ever-increasing demand for electrical power, as also have the needs of those industries which are concentrating on the export trade. Yet it is at this moment when the whole energies of the electrical industry should be devoted to increasing output, should be putting into operation the plans which they have ready, should be doing everything with the very limited resources which are available to them, due to the Government's failure to supply them with sufficient quantities of raw materials to increase their distribution network—it is at this moment that the Government sees fit to dissipate their energies, to slow down the whole progress of extension, by the introduction of this Bill."

Where are we going?

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN consequence of the appointment of Mr. G. Tomlinson as Minister for Education in succession to the late Miss Ellen Wilkinson, **Alderman C. W. Key** has been appointed Minister of Works and he will also be a member of the Privy Council.

Mr. B. C. Evans, Companion I.E.E., chairman and joint managing director of Veritys, Ltd., has retired from the board on the completion of fifty-five years' service with the company. He is being retained in an advisory capacity. **Mr. C. J. Pitt,** F.C.I.S., managing director, has been elected chairman of the company.

Mr. B. C. Evans

Mr. Evans is one of the best-known men in the electrical industry and has taken part in every movement which has had for its object the welfare and advancement of the industry. He has been particularly active in connection with B.E.A.M.A. affairs and the Dynamo and Motor Makers' Agreement. In 1941 he commemorated his jubilee with Veritys, when at a luncheon given in his honour by his senior colleagues, he was presented with an inscribed gold watch and chain.

Commander Edward Whitehead, R.N.V.R., who has been closely identified with training, education and resettlement problems in the Royal Navy, has been appointed general secretary and Public Relations Officer of the British Association for Commercial and Industrial Education.

Mr. H. Harrison, whose appointment as borough electrical engineer and manager at Tynemouth was reported in our last issue, served as a pupil with Mr. L. H. King in the Whitby Urban District Council's electricity undertaking where he subsequently became junior mains engineer. In 1915 he entered the Royal Artillery and served throughout the remainder of the 1914-18 war, being demobilized in 1919 with the rank of lieutenant. In 1920 he joined the North-Western Electric Supply Co., Ltd., as assistant mains engineer, and two years later went to Bolton as sectional mains engineer in the Corporation Electricity Department. He became associated with the Tynemouth Corporation Electricity Department in 1935 as mains engineer, being promoted to deputy borough electrical engineer in 1946.

Crompton Parkinson, Ltd., announce a number of changes in their sales organization: **Mr. H. H. Spencer,** M.I.E.E., relinquished his position as branch manager of the London Plant Division on February 10th, to take over special duties in the sales director's department. He has been succeeded by **Mr. J. B. Scott,** D.F.C., formerly branch manager of the Manchester Plant Division, which position is now held by **Mr. R. Speirs,** M.I.E.E., previously with the London Plant Branch. **Mr. T. A. Littlewood,** who has been acting branch manager of the Birmingham Plant Division for the past year, is confirmed in that position as from February 3rd.

Mr. Robert Foot, O.B.E., M.C., chairman of the Mining Association, has resigned the presidency of the Coal Utilization Joint Council on the National Coal Board's taking the place of the Mining Association of Great Britain as a constituent member of the C.U.J.C. At a recent meeting of the Council, **Mr. J. C. Gridley,** C.B.E., marketing member of the National Coal Board, was elected president for 1947.

Mr. A. McVie, B.Sc. (Eng.), has been appointed commercial director of Standard Telephones & Cables, Ltd., in succession to **Mr. C. W. Eve,** who is retiring. Mr. McVie, who was recently re-elected chairman of the British Radio Equipment Manufacturers' Association, relinquishes

Some of those who attended the Wallasey electricity undertaking's jubilee celebrations on January 29th. Left to right: Mr. J. Boucher, Mr. W. J. Forster, Alderman Mrs. Gregory, Alderman Gill, the Mayor (Alderman King), Sir John Kennedy, Alderman Sir William Walker and Mr. J. S. Pickles

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his position as general manager of Kolster-Brandes, Ltd., but remains a director of that company.

Mr. R. Bate has been appointed general sales manager of the Brush Electrical Engineering Co., Ltd. Mr. Bate, who until recently was manager of the Transformer Department, now becomes responsible for sales of all Brush products under the direction of Mr. I. A. Marriott who, as recently announced, has been appointed commercial director of Brush as well as of Associated British Oil Engines, Ltd.

Mr. R. McGregor, previously with the English Electric Co., Ltd., Stafford, has been appointed assistant mains engineer with the Adwick-le-Street Urban District Council Electricity Department.

Mr. J. G. Potts retired last week from the position of electrical engineer and manager of the Bury (Lancs) Corporation, which he had held for twenty-four years. His successor, as we have reported, is **Mr. J. Mills.**

Mr. B. C. Ossitt has been appointed street lighting superintendent to the Borough of Nuneaton and will commence his duties there at the beginning of March.

Mr. C. H. Crowlie for many years southern sales manager, has been promoted to sales manager for Great Britain of Hoover, Ltd. **Mr. W. Norden,** southern branch manager, succeeds him as southern sales manager.

As a result of new appointments the directorate of the Phosphor Bronze Co., Ltd., is now as follows:—Mr. J. L. Hardy (chairman), Messrs. G. T. Hyslop and W. Smithson (joint managing directors), Mr. C. V. McNeill (sales director), Mr. E. H. Powis (director), Mr. D. L. Roome (director and secretary), Mr. A. N. Wormleighton (director and cost controller) and Mr. F. R. Wix (director),

Mr. R. W. P. Holt, M.I.Mech.E., has been appointed to the board of the Widnes Foundry & Engineering Co., Ltd.

The London Power Co., Ltd., celebrated its twenty-first anniversary at a dinner at the Café Royal on February 5th. About 400 of the staff were present and in the absence through illness of the chairman of the company (the Earl of Lytton), the deputy-chairman (Major H. Richardson, M.C.) presided. Among the guests were Miss Caroline Haslett, Lord Hyndley, Sir Edwin Herbert, Sir Giles Gilbert Scott ; Sir Cyril Hurcomb, Sir John Kennedy and Mr. H. Nimmo (Electricity Commissioners); Mr. H. Hobson, Sir Johnstone Wright, Mr. J. Hacking, Mr. E. R. Wilkinson, Mr. J. N. Waite (C.E.B.); Mr. H. J. Randall (City of London Company); Mr. J. W. Rodgerson, and representatives of the executives of the constituent companies of the London Power Co. Directors of the company present included Major H. Richardson, the Hon. E. Butler-Henderson, Sir Leonard Pearce and Mr. H. T. Young.

Major Richardson proposed the toast of the visitors, and Lord Hyndley and Miss Caroline Haslett responded. Miss Haslett's reference to the recent award of the Faraday Medal to Sir Leonard Pearce was warmly received. In reply to a toast of the company by Sir Edwin Herbert, Sir Leonard Pearce briefly reviewed the company's achievements. Sir Cyril Hurcomb proposed the toast of the chairman. A musical programme followed the speeches.

The fifth annual dinner of the Foremen's Association of the Micanite & Insulators Co., Ltd., was held at Frascati's Restaurant on January 31st, and was presided over by **Major S. M. Mohr,** O.B.E., M.C., M.I.E.E., managing director. The function was made the occasion of a presentation of a casket of cigars to **Mr. W. Richardson** on his retirement after fifty years' service with the company. Mr. Richardson joined the company in December, 1896, at the age of fifteen. The Association has a total membership of 70, 31 being honorary members.

The London Branch of the Purchasing Officers' Association held a dinner-dance at the Connaught Rooms on February 3rd, under the chairmanship of **Mr. W. H. Napper** (South Suburban Gas Co.). On this occasion the election of the Association's 1,000th member was celebrated, and in handing this member (Mr. E. C. T. Humberstone of Hawker Aircraft Ltd.) his diploma, Mr. W. Gildon (a founder member and past-president) briefly reviewed the rapid progress the Association was now making.

Obituary

Mr. J. E. Pownall.—We regret to report that Mr. John Edmund Pownall, A.M.I.E.E., A.M.I.Mech.E., died on February 3rd, following an operation. Mr. Pownall, who was sixty-six, retired from the position of deputy borough electrical engineer of Tunbridge Wells in April, 1945, after holding the post for over thirty-one years. Before going to Tunbridge Wells, Mr. Pownall held positions with the Bolton, Dover, Hammersmith and Hampstead electricity supply undertakings.

Mr. G. E. W. Knowles.—We regret to record the death at the age of thirty-eight of Mr. George Ernest William Knowles, B.Sc.(Eng.), A.M.Inst.C.E., A.M.I.E.E., A.M.I.Mech.E., engineer and manager of the Settle & District Electricity Co., Ltd. He joined the company in 1936 as distribution engineer and took control on the death of Mr. C. E. Jewell in 1937. Previously he was assistant mains engineer with the Yorkshire Electric Power Co.

Mrs. A. Lackie.—We regret to learn of the death of Mrs. Anne Lackie at the age of seventy-six, after a long illness, wife of the late Mr. W. W. Lackie, C.B.E., Electricity Commissioner, which occurred on January 30th at Weybridge.

Commons Debates Coal

Opposition Charges and Government's Defence

IN the House of Commons on Friday last week Mr. Stanley Prescott opened a debate upon the coal situation by drawing attention to the grave position in the Lancashire cotton industry owing to inadequate and inferior supplies of coal.

Mr. R. Blackburn, referring to the position at the Austin motor works, said he had been passed on from Department to Department and the Government seemed to have no control over bureaucracy.

Mr. Anthony Eden said that the country was faced with the greatest industrial crisis for twenty years. The Minister of Fuel and Power and the Government had taken too optimistic a view of the gap between the industrial demand and the available coal. The " Cripps " allocation scheme had been introduced too late and now we had to accept hastily improvised plans. All the energies of the Minister and his staff seemed to have been devoted to the Coal Board and the Electricity Bill.

In his reply Mr. Shinwell said that there were nineteen million people at work in this country and the consumption of fuel and power was the highest in the country's history. He had repeatedly issued warnings at conference after conference. He had inherited a legacy of shortage of man-power and in spite of the fact that last year more than 76,000 persons entered the coal-mining industry there was still a shortage aggravated by increasing age of miners, illness and accident.

Power Stations' Rising Demand

Reviewing the increase in demand, Mr. Shinwell said that the estimates of weekly requirements by the Central Electricity Board had rapidly risen from 540,000 to 720,000 tons. The same considerations applied to the gas industry. It was impossible to prepare plans to meet such a demand.

He maintained that the allocations arranged would have been made if adverse weather conditions had not intervened. The dislocation of coal supplies thus caused necessitated immediate curtailment of supplies to industry and restrictions upon domestic consumers. The Electricity Commissioners would circularize electricity supply undertakings notifying them of this decision. He hoped that these measures would enable the full supply to be restored in a week or so.

Later in the debate, replying to Major G. Lloyd George, his predecessor as Minister of Fuel and Power, Mr. Shinwell said that he was allocating the available supplies as evenly as possible. Consumption of coal for electricity had increased in January by 26 per cent as compared with January, 1946.

Mr. Clement Davies said that the rising demand for electricity became obvious during the war. Preparations should have been made to meet it or a coal-rationing scheme should have been introduced.

Diminishing Stocks

On Monday at the end of questions the Prime Minister made a statement on the situation in reply to Mr. Churchill. He said that the essential factors were that shortage of coal had led to a critical position every winter for five years owing to insufficient stocks. During the war the closing of non-essential industries, the black-out and the imposition of double summer time curtailed demand and enabled the crisis to be overcome. In addition, weather conditions were not excessively bad. In April there was only 6,000,000 tons of coal in stock and in spite of every effort to increase stocks the country started the winter with only 11,000,000 tons against 14,000,000 the year before. Restarting of industry caused a rapid increase in demand, especially for electricity. The latter increase greatly exceeded the estimate of the Central Electricity Board and prevented the building up of stocks at electricity stations to the four weeks' supply recommended by the Board. In addition to the coal position, the available plant, which owing to the war had not been increased, was rapidly approaching a situation in which it would be overloaded.

Mr. Attlee then gave details of the immediate steps being taken and said that, given full co-operation by all consumers stocks at the power stations should begin to rise; without that co-operation even more drastic measures would have to be taken. Reports that morning showed an excellent response.

Mr. Churchill asked how it was that the intimation of these drastic cuts in electricity supply affecting the whole industry of the country was only mentioned in the House at the end of a speech by the Minister of Fuel and Power late on Friday afternoon, and why due warning was not given beforehand. What were the Prime Minister's ideas about an immediate debate?

Mr. Attlee said that the decision to make the cuts was taken on Friday. The Leader of the House would be perfectly willing to meet any proper demand for a further debate. Asked by Mr. Churchill why the decision was only reached as late as Friday, the Prime Minister said that they took their decision when the reports of the experts told them that it was necessary.

After further discussion Mr. Greenwood (Lord Privy Seal) said he was prepared for the House to be adjourned to allow a general

discussion on the matter, and on the motion for the adjournment Mr. R. S. Hudson opened the debate. He said that the gravamen of the Opposition's charge against the Minister of Fuel and Power was that he was warned repeatedly, yet he took no adequate steps to build up stocks during the summer. The Minister's excuse that the consumption of vital commodities, and certainly in the sphere of fuel and power, was higher now than at any time, was untrue. The daily tonnage of coal consumed in Great Britain, including shipments to Northern Ireland, expressed to the nearest million tons, was 185 for 1946 as against 196 for 1940, 198 for 1941 and 197 for 1942.

Mr. Shinwell replied that he had been referring to peacetime consumption, not wartime.

Continuing, Mr. Hudson referred to coal requirements and stocks. He said that Mr. Shinwell had been told at the beginning of the winter that the electricity industry would require 559,000 tons a week, and only in five weeks out of sixteen to date had that delivery been achieved; in the remaining weeks it was from 425,000 to 557,000 tons. Even without the bad weather it was almost certain that a similar crisis would have come upon us either at the end of this month or early in March. It was not until Saturday morning that the power companies had been called in and told, in effect "Here is the Minister's decision. What are you going to do about it?"

Mr. Shinwell, in replying, said that the situation had developed not in the last few weeks or even months. The inadequacy of our coal stocks as a cardinal factor in relation to our national economy began to emerge after the French disaster in 1940. Dealing with the immediate crisis, he said that before the fuel allocation plan could be brought into operation the country had been struck by a blizzard unexampled in the last fifty years.

Later in the debate Mr. Dalton (Chancellor of the Exchequer), after giving figures relating to stocks, said that steps must be taken to prevent them again having low stocks at the beginning of the winter. It would almost certainly mean that some restriction would have to be placed on the increased domestic use of electricity and gas. A scheme of allocation or rationing as between industries would have to be worked out based on the experience we were now passing through.

Power Restrictions

Arrangements for Industrial and Domestic Consumers

LAST week-end, as a result of the prolonged wintry weather which has dislocated coal production and transport, the Minister of Fuel and Power announced that it was necessary to impose severe restrictions for the purpose of safeguarding the supply of electricity for vital services. As from Monday, February 10th, in the London and South East England, the Midlands and the North-Western areas, the supply to domestic consumers, restaurants, offices, shops, warehouses, cinemas, etc., would be cut off between the hours of 9 a.m. and noon and from 2 to 4 p.m. In cases where such consumers were supplied by cables providing electricity for essential services they would be expected to switch off voluntarily.

All industrial undertakings except those specified as essential services would have to stop using electric power except for the purpose of preventing damage to plant and materials (including continuous processes) and for moving coal and raw materials, including the loading and unloading of goods. Among the industries and services regarded as essential were those concerned with water, gas, sewage, coal production and transport, hospitals, postal services, agriculture, food production and processing establishments, daily and evening newspapers and the B.B.C.

Several large undertakings expressed their inability to exercise the discrimination expected of them. It was stated by the Birmingham Electric Supply Department that it was impossible to switch off consumers and at the same time maintain essential services except by adopting the impracticable course of dealing with individual installations. Consequently supplies would be maintained and reliance placed upon the honesty of consumers. A similar statement was made by the Lancashire Electric Power Co. which, in saying that supplies would have to be continued, reinforced the Minister of Fuel's appeal for the utmost economy.

The latest figures published by the Ministry, those for December, showed that weekly consumption of coal at power stations had risen from 528,000 tons in December, 1945, to 626,000 tons and that the average stocks of coal had been reduced from 5·1 to 2·7 winter weeks' supply.

On Monday there was evidence that the load on power stations was being considerably reduced. It was reported from Battersea, for instance, at about 10 a.m., that the load had fallen to 100,000 kW from about 235,000 kW. The County of London Electric Supply Co. was unable to cut off supplies. Birmingham stated at 10 a.m. that the demand on the undertaking was only 100,000 kW as compared with 400,000 kW on the previous Monday. Lack of response to the economy appeal at Dartford led to the cutting-off of the town's supply causing the disruption of essential services. The same thing happened at Derby.

Manchester reported a very good response, the demand after 9 a.m. falling to a third of normal and averaging about a half of normal during the rest of the day. At Liverpool there was a reduction of about 55 per cent in the demand during the periods of restriction. It was impossible to cut off supplies in Northampton, but voluntary action reduced the demand by about 25 per cent.

At Sheffield (which was not in an area specified for restriction) the non-delivery of 12,000 tons of coal necessitated the Electricity Department's making an urgent appeal to industrialists to cease using electricity by noon. Essential services were continued and furnaces were supplied until 5 p.m. It was later announced that the Ministry of Fuel had arranged for a special supply of coal to keep the undertaking running.

It was announced on Monday evening that all greyhound racing was to cease and that the B.B.C.'s Third Programme was to be suspended. On Tuesday the Southern Railway cancelled sixty suburban trains and the London Passenger Transport Board reduced its tram and trolley bus services.

Premier's Broadcast Appeal

The Prime Minister broadcast an address to the nation on Monday evening in which he gave an outline of the origin of the coal shortage which, he said, dated back to 1943. The position had been worsened by the rapid rise in the rate of industrial development which had particularly affected the electricity supply industry. The increase in the use of electricity had been far more rapid than the responsible authorities had expected. The saving through appeals for economy and load shedding would have enabled us to get through the winter had it not been for the recent exceptionally bad weather.

As it was, production and transport of coal had been very adversely affected in spite of the great efforts made by miners, seamen, dockers and transport workers. Even after a general thaw had set in it would take some time to get everything moving smoothly again.

Mr. Attlee said that in this way a grave emergency had arisen and severe restrictions had had to be imposed. He appealed to everybody to see that electricity and gas consumption was reduced to the utmost. So far the response had been most encouraging. The country had got through greater emergencies and more critical times. We would get through this emergency if everybody did everything possible to help.

Domestic Equipment Production

In the House of Commons on Monday, Brigadier Rayner asked the Minister of Supply when the Central Electricity Board first pressed for the control of the production of domestic electrical equipment; how often this request was renewed; on what grounds it was rejected; and whether any restrictions were now being enforced on the production of these goods.

Mr. Wilmot said he had received no such request from the Central Electricity Board. Production of domestic electrical appliances was controlled by licence under the Electrical Appliances (Control of Manufacture and Supply) Order, 1942.

New Zealand Electricity Finance

Heavy Payments for Taxation

INCOME tax, social security and national security taxes amounting to £423,674 had to be paid by the New Zealand State Hydro-Electric Department out of a total revenue for 1945-46 of £2,892,177. On the North Island system (revenue £1,927,143 and gross profit £964,510) there was a net deficiency of £91,615 and it was not possible to meet any of the statutory payment of £272,588 for loan redemption, the arrears on this fund now amounting to £376,531. On the South Island system (revenue £964,994 and gross profit £647,297) a balance of £137,043 was applied to loan redemption, the arrears outstanding being increased by £1,498 to £176,623. Apart from heavy taxation, the financial position has been adversely affected for the past few years by power shortages and the necessity of operating comparatively expensive fuel-burning plants. The Minister in Charge (the Hon. R. Semple), in submitting this report to the New Zealand Parliament, said it was hoped that with a return to more normal times they might obtain some relief from these difficulties.

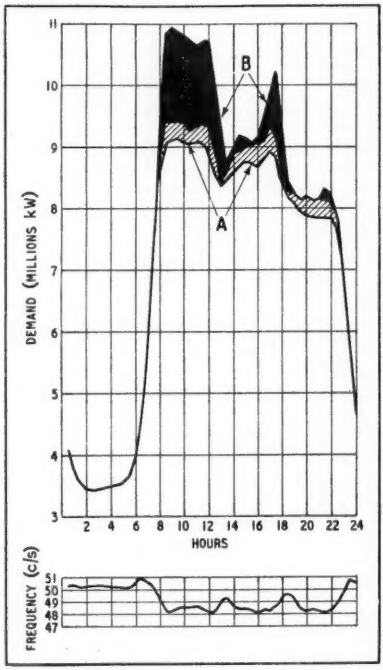
The report of the general manager contains the following information relating to system operation (1944-45 figures in brackets):—North Island: Maximum half-hourly load, 306,400 kW (295,000 kW); kWh generated and purchased, 1,576·0 million (1,532·5 million). South Island: Maximum half-hourly demand, 121,460 kW (117,890 kW); kWh generated, 678·2 million (634·2 million). In the North Island load had to be shed during a cold spell which set in on May 28th, 1945, and throughout June and early July load rationing was necessary.

New power schemes are proceeding at Karapiro and Kaitawa (Waikaremoana) in the North Island and Tekapo in the South Island. It is hoped to have the first unit at Karapiro ready during the first half of this year and two other 30,000-kW units at intervals of three to four months. The Kaitawa development should be completed this year and a further 20,000-kW set installed at Arapuni. Other stations will follow that at Maraetai, and if fully developed the river could ultimately produce over 800,000 kW.

Plant Shortage

Central Board's Review of the Situation

FACTS about the present power supply situation were given to representatives of the technical press last week at a meeting called by the Central Electricity Board. The matter has been given greater prominence recently by reason of the cuts in supply which the severe weather has made necessary. An outstanding point is that January 30th saw the highest demand on the grid system so far recorded—10,920 MW; the estimated maximum demand



National load curve, January 30th
A=Effect of low frequency. B=Load actually shed.

during last winter was 9,210 MW when "load shedding" was also resorted to. To meet this demand there was an available output of only 9,092 MW ("sent out"); the difference, 1,828 MW, was accounted for to the extent of 1,533 MW by load shedding and by allowing the frequency to fall to 48·4 c/s, which gave a relief of 295 MW.

The accompanying curve illustrates the effect of load shedding and frequency reduction. It should be pointed out that the afternoon "cut" was not due to a national overload but to excessive demand in S.E. England. To meet this by feeding in from other areas would have so overloaded interconnectors as to have caused them to trip out, with unfortunate results. It is hoped by the end of this year to have a new North-South reinforcing line in commission.

In the following table the positions on January 29th, 1947 (when the highest generation was recorded), January 30th, 1947, and January 21st, 1946, are compared. The figures for this year's dates are preliminary only.

	Jan. 29th, 1947 MW s. o.	Jan. 30th, 1947 MW s. o.	Jan. 21st, 1946 MW s. o.
Rated max. output cap.	10,666	10,666	10,527
Output capacity not available due to:			
Breakdown	852	914	652
Overhaul	207	204	439
Unsuitable fuel	347	374	237
Other causes	99	150	352
Circuit restrictions	9	9	16
Total reductions	1,514	1,651	1,696
Rated capacity of available plant	9,152	9,015	8,831
Load actually met	9,261	9,092	8,906

The table shows that since January 21st, 1946, the loss due to breakdown of plant has increased by some 50 per cent, and that the losses of capacity due to overhaul and other causes have been reduced by more than 50 per cent. The loss due to unsuitable fuel has been increased by more than 50 per cent. Operating conditions for the past three months have been exceptionally severe, as will be seen from the fact that generation has been maintained at a level higher than 9,000 MW since the beginning of December without any respite on plant which to the extent of about 15 per cent of the total is well over twenty years old.

The difficulties of carrying out load shedding up to values as high as 25 per cent are extreme and call for the greatest care in dealing with the heavy transfers of energy which are introduced on the grid network. Difficulties arise not only during the peak load periods between 8 a.m. and 6 p.m. when there is insufficient plant to meet the total load in the country, but also later in the evenings and on Sundays when generation has on occasion to be restricted in order to avoid dangerous overloading of transmission lines.

Sustained operation at low frequency for long periods has made it impossible to carry out the necessary clock correction during the night period and in present circumstances correction of synchronous electric clocks has had to be discarded. Load shedding has had to be a feature of normal daily operation and

reached a maximum on January 30th, when the load shed was 1,533 MW. The number of days on which load was shed has been as follows: October, 1946, 6; November, 1946, 9; December, 1946, 19; and January, 1947, 19.

Difficulty in the obtaining of necessary replacement parts has kept plant out of commission for long periods and the construction of new stations has been retarded by steel shortage and prevailing labour and material conditions. The Board considers that it may even be necessary to shed load during the summer months to allow machines to be overhauled in preparation for next winter's load.

Added to plant difficulties there has been the problem of coal supplies, a matter which has caused serious dislocation this week. The effect of unsuitable fuel is noted in the table.

Faraday Lecture

I.E.E. Southern Centre Meeting at Southsea

A LUNCHEON held at Southsea last Saturday by the Southern Centre of the Institution of Electrical Engineers was followed by the Faraday Lecture. Mr. J. A. P. Farrant (Centre chairman) presided at the function at the Queen's Hotel and after referring to the good representation of the Admiralty, welcomed especially Mr. J. Hacking (chief engineer, Central Electricity Board), vice-president of the I.E.E., and the Lord Mayor of Portsmouth (Councillor A. S. Winnicott), both of whom briefly responded.

The company then proceeded to the South Parade Pavilion, where a large audience had assembled to hear the Faraday Lecture given by MR. HACKING on "The Generation and Wholesale Distribution of Electricity," which was preceded by an introduction by the Lord Mayor. The lecture, which mainly took the form of the interpretation of data shown on a screen, was in two parts. The first related to the growth of the electricity supply industry, with estimates of future growth until 1960-61 and conditions under which progress could be maintained; in the second part, the potentialities of such developments as gas turbines, district heating, heat pumps and atomic energy were discussed.

At the outset graphs were shown which related plant installed to maximum demand as calculated in advance for 1946-47, 1948-49 and 1949-50 and showed clearly the inevitability of recent load-shedding, which must be expected again next winter. Conditions would probably be worse next winter but a slight improvement could be expected in 1949-50, if plant were made available. Thereafter the position would depend upon the ability to secure sites for new stations without delays due to protracted official enquiries into objections regarding the limited choice of suitable sites available.

The cause of the present shortage of plant was the deferment of the plant programmes drawn up during the war as a deliberate but justifiable decision of the Government then to give priority to the need to manufacture munitions, and the consequences of that decision had to be accepted by all now. During the war, however, the grid had been able to give all supplies as soon as they were required for new armament works, wherever situated.

If a growing demand for energy were taken as a measure of the standard of civilization, it was satisfactory to see that between 1920 and 1945 the consumption of electricity had increased 8·6 times and that of gas 1·6 times; at the same time the use of raw coal had dropped considerably. By 1960 the demand would be at least two thirds greater than it was now, which would mean an addition of some 18,000-MW after allowing for obsolescence of existing generating sets.

Referring to the question of why power stations were not erected at the coal fields, Mr. Hacking pointed out that coal could be transported more cheaply, especially by sea routes, than electricity could be transmitted to load centres. Another requirement was suitable road or rail access to a power station site.

The need for cooling water to an amount of 5½ million gal per hr for a 100,000-kW station generally restricted sites to the larger river flows and where good foundations also could be provided.

From a graphic representation of the numerous distinct types of coal required for various purposes, the lecturer showed how selective were some industries compared with that of electricity supply. Thus for domestic and railway uses the larger sizes were necessary, whereas for electricity dry (unwashed) slacks and smalls could be used.

A gas turbine of up to 27,000-kW output capacity with an initial gas temperature of 1,200 deg F was now under construction

and up to 60,000-kW on the closed cycle system with separately fired heat exchangers was a future possibility but no practicable design had yet been produced. It was in the development of the gas turbine that the best hope for district heating lay, since the use of the heat in the exhaust for the purpose would not lower the efficiency of the production of electricity as it would in the case of steam.

Heat pumps could yield in practice three times the amount of energy as heat as that required to drive them, but the capital expenditure incurred would be heavy. Resources of hydro-electric and tidal power in this country were too small to affect the issue appreciably and the Severn scheme would be economic only if the cost of coal rose to 49s. 1d. per ton from its present high level of 47s. 9d.

The only immediately probable method of using nuclear energy seemed to be in the form of plutonium in conjunction with uranium, although in the distant future the conversion of hydrogen to helium presented a possibility. Present estimates indicated that coal would have to reach 52s. per ton before the cost of nuclear energy would be economically justifiable and its main scope would probably be in places where coal was not available and then only in conjunction with gas turbines. The above summary represents only the general lines of the address, which included many detailed figures and touched upon other aspects of its main theme.

Proposing a vote of thanks to the lecturer, Alderman J. P. D. Lacey stated that a kind of "Gallup poll" had been taken in Portsmouth in order to ascertain the requirements of the public regarding electrical appliances. One in ten of the applicants for council houses were taken at random and of these 75 per cent preferred electricity for cooking and 77 per cent for wash-boilers. In seconding the proposal, Mr. Julian Snow, M.P., suggested that the public took the admirable work of the Central Electricity Board too much for granted and expressed his interest in district heating as a desirable social measure.

I.M.E.A. and the Bill

Action to Secure Amendments

AT next Thursday's extraordinary general meeting of the Incorporated Municipal Electrical Association (Central Hall, Westminster, 10 a.m.) five resolutions will be submitted. The first provides for action to secure "District Distribution Units" and "District Committees" in lieu of the Consultative Councils proposed in the new Electricity Bill. If this should prove unsuccessful it is proposed (Resolution 2) that steps shall be taken to secure that local authority members of the Consultative Councils shall be elected by the local authorities in the areas and not appointed by the Minister of Fuel and Power.

The third resolution seeks to secure that the Minister, in the exercise of any of his powers in relation to an Area Board, shall first consult the Central Electricity Authority. Also that the Central Authority shall consider any conclusion, report and representations notified or made to it by Area Boards and the Area Boards, after consultation with the Central Authority, may make representations to the Minister on any matter arising therefrom.

By the fourth resolution the Association is to endeavour to secure more adequate compensation for local authorities, including compensation for all losses arising from the severance of the electricity undertakings from other activities. The final resolution is to empower the I.M.E.A. Council to take action to secure such amendments to the Bill as would give effect to the resolutions adopted by the Association and such other amendments as may be considered necessary in the interests of the electricity supply industry.

The Association has sent us a memorandum on the proposed reorganization, dated December 17th, which it has submitted to the Minister of Fuel and Power. In this the Association agrees with the principle of public ownership and with the establishment of a Central Authority to be responsible for generation and main transmission and to exercise general control. While it is agreed that there may be economies in personnel and overhead expenditure with a small number of Area Boards it is felt that these Boards would be too remote from day-to-day problems.

It is therefore recommended that each area should be sub-divided into a number of suitable districts for each of which there should be a District Distribution Unit with delegated powers. Where existing undertakings are too small to form satisfactory District Units, a sufficient number would be amalgamated. In this way each area would be covered by District Units of suitable size based upon the structure and technical set-up of existing undertakings. The District Committees would comprise representatives of the local authorities, industry and trade unions.

It is considered that such an arrangement is "inevitable in the early stages and, with careful selection, can be made part of the permanent structure with a minimum of disturbance to the industry."

The Grid in Wartime

Electricity Supply Engineers' Testimony

AN account of the British grid system in wartime was given in the paper Messrs. J. HACKING and J. D. PEATTIE (Central Electricity Board) presented to the Institution of Electrical Engineers last week.

The authors described pre-war preparations for operating procedure and the provision of an alternative control organization, methods of protecting plant and the collection and utilization of a national pool of spare equipment for emergency replacements.

Subsequent experience in the war years, which is less well appreciated, was surveyed in greater detail while graphs and tabulated data illustrated how the loading of the grid had changed in both magnitude and distribution. Consequential problems related to the design and building of power stations to carry those loads were referred to, plant availability and the supply of fuel being also discussed.

War damage was briefly mentioned; an account of the development of the transmission system was included and the various classes of overhead line faults due to circumstances of war were indicated, as well as the emergency remedies

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The discussion was opened by MR. J. W. J. TOWNLEY (West Ham) who said that the decision to provide a pool of spares must have been a very difficult one to make, but the event showed that the spares had been well selected and were absolutely necessary. The grid, which was originally designed as an interconnecting system, had had to be used as a transmission system during the war; had it not been in existence the effect on wartime production, a great deal of which was concentrated in the South-West of England and in South Wales, would have been extremely serious.

He hoped that the human story behind what had been achieved would one day be told. No organization, however well prepared, could have maintained the unexpectedly high standard of service afforded by the electricity supply industry without the devoted attention to duty and courage of all ranks.

The loss of capacity due to unsuitable fuel still persisted. They were to-day using over 1,000,000 tons more fuel per annum in the generating stations of this country, at a cost to the industry of over £2,000,000 per annum, than would be required if the 1939 quality had been maintained.

MR. H. NIMMO (Electricity Commissioner) referred to the obtaining of priority for generating station and grid extensions during the war, mentioning that the "Priority of Production" direction issued in 1940 contained no reference to electricity. At that time he was principal priority officer for the Commissioners and with a little persistence it had been possible for the generating station extensions then in hand to obtain a fair share of the equipment required.

In September, 1940, in the London area alone fifteen generating stations and four grid substations suffered war damage; at the end of that month 200,000 kW of plant was immobilized. In October, eleven generating stations and two grid substations were damaged and 266,000 kW of plant was immobilized. That was the highest figure attained at the end of any month during the war. In November, six generating stations and three substations were damaged.

Adding faults on other undertakings to those on the grid, the total number due to war causes was about 6,000. More than fifty men were killed and over a hundred seriously injured. The total cost of the damage was about £10,000,000. In spite of all that and because of the existence of the grid, the provision of essential supplies was never "too little or too late."

Plymouth "Incident"

MR. H. MIDGLEY (Plymouth) gave a graphic description of what happened at Plymouth when on January 13th, 1941, a 500-lb h.e. bomb crashed through the side of the switch-house of the generating station and exploded inside, starting a fire and severely damaging the switchgear, half of which was wrecked beyond repair, while the other half had to be reconditioned at the makers' works. Happily the possibility of such a thing happening had been foreseen, and a supply was obtained from a large private generating plant to serve hospitals and control centres. By connecting one of the grid transformers to one of the undertaking's step-up transformers they were able to commence restoring supplies to the city twenty-four hours after the incident, a second such connection being completed twenty-four hours later, eleven bays of pool gear being erected and commissioned eleven days after the incident. The first section of the reconstructed permanent switchgear was commissioned in September, 1941, and the remainder just over eleven months after the incident, when the whole of the pool gear was released.

MR. J. F. FIELD (Edinburgh Electricity Department) speculated on what might have happened had the grid not existed. For defence reasons the size of individual stations had been limited to 150 MW, except in special cases. In his opinion that limit should be

abolished and the construction of very much larger stations envisaged; the demand for electricity was going up and within the next ten years a grid load of anything up to double the present load must be expected. In 1926 nearly all energy was transported as coal almost to the point of consumption, but he hoped the day would come when the cost of cable would be so low that it would pay to transport the energy entirely by cable.

MR. W. N. C. CLINCH (Northmet Co.) paid a tribute to the courage and tenacity of purpose of all those concerned with electricity supply during the war. Brighton had a great attraction for tip-and-run raiders, and the way the men in the power stations stood up to those raids was amazing, and deserved more recognition than it had received.

MR. W. C. PARKER (Fulham Electricity Department) said that the organization and work described in the paper proved the truth of the saying that the war had been an electrical war, and it was the grid system which had made it possible for this country to win it. The paper, however, made no reference to the steps which designers of power stations should take to deal with a possibility of war in the future. The situation, if there should be another war, would be totally different.

He described the Fulham "incident" and said as a result of that experience, they had installed in a different part of the power station a control room, so that if another incident of the same kind had occurred there would be people in the station who had not been in immediate contact with the explosion and who, by acting immediately, could probably prevent a considerable amount of further damage.

The right system to adopt for fire protection had not yet been settled. Other problems requiring solution were that of the great disparity between the day load and the night load; and the urge for higher efficiency with higher pressures and temperatures on the one hand, and on the other the need to be able to start up and shut down sets as quickly as possible.

MR. FORBES JACKSON (L.C.C.) observed that the freedom from interruption of supply which this country enjoyed during the war was no accident, but was the result of first-class planning and co-operation throughout the whole industry. He suggested that 652 copies of the paper should be sent to "another place."

MR. J. ECCLES (Liverpool Corporation) suggested that a logical conclusion to be drawn from the paper was that in any scheme of planning the planners must know more than the planned. The grid had made it easy to transport power from one place to another. But for that facility, additional generating plant would have had to be installed. That would have taken time, but it would have meant that to-day that additional plant would be available.

The maximum amount of plant put out of service by the enemy at any one time was 200,000 kW. If the voltage was changed in future from 230 to 240 without changing apparatus, an immediate increase of almost exactly 200,000 kW would be put on the grid system.

MR. J. HACKING, in the course of a brief reply, said that even if there had not been any grid it would still have been necessary to site war factories in remote places and stations would have had to be built to supply them. The country might have obtained more generating plant as a result, but the resources of the country would have had to be diverted to the manufacture of that plant, thereby diminishing the output of munitions and perhaps affecting the course of the war.

Gas Reorganization

Companies' Proposals to Minister

WE have received from the Association of Gas Corporations (representing the company undertakings) a copy of a booklet—"Reorganization of the Gas Industry"—which has been submitted to the Minister of Fuel and Power. A covering memorandum says:—"It is considered that these proposals are more workable, more just, and certain to produce more benefit to the public as gas consumers, than either the proposals of the Heyworth Committee (which was handicapped by lack of practical experience of the gas industry) or nationalization on the lines of the Electricity Bill. They could be financed without difficulty."

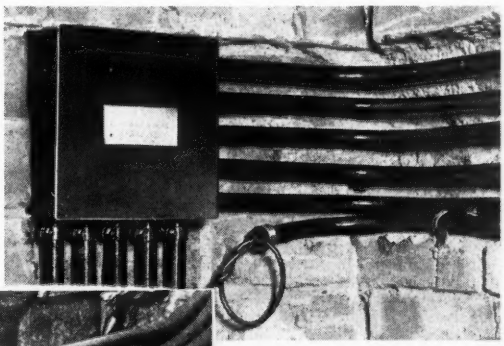
Briefly, it is suggested that the operational units should be integrated into compact geographical groups (compulsorily if necessary) responsible to Gas Commissioners appointed by the Minister of Fuel and Power, who would decide appeals against their decisions, confirm or modify their orders, and control the testing of meters and gas. It is proposed that the British Gas Council and the Federation of Gas Employers should continue to function with suitable modifications to adapt them to the new structure.

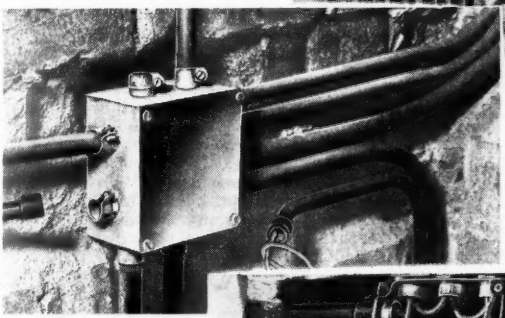
Powers for the area of each scheme would be granted to the body (whether publicly or privately owned) considered to be the most suitable, or operational units could be formed voluntarily by groups of existing undertakings. Company undertakings' stocks would be acquired on a "maintainable dividend" and "yield basis" arrangement, necessitating the issue of stock at different interest rates. It is proposed that municipal undertakings should be paid on the "fair value" of their property—not just the amount of the undertakings' outstanding debt.

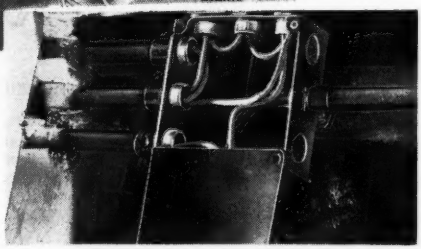
House Wiring

Withdrawable Installations Without Elbows and Tees

AMONG the re-housing schemes now proceeding in East London is that of the Ilford Borough Council, which is erecting permanent small dwellings in Essex in adjacent semi-detached pairs. They are brick-built in traditional style and of conventional lay-out, containing two or three living rooms and kitchenette on the ground floor with three bedrooms and bathroom above. The first few are now nearing completion. The electrical contractors for the greater number of some 220 houses to be built on this estate are L. Power & Son, Ilford and Bow, under the supervision of Mr. J. Power with Mr. J. W. Mahoney in charge of the installation department, who together devised means of carrying out the installation in compliance with the specification issued by the Borough Electricity Department.







Typical "through" service boxes: (top) in hall recess; (centre) intake under staircase; (lower) bedroom landing floor

Uncommon methods were necessitated by the requirement that the wiring (d.c. at 250 V) must be inspectionable, which meant completely withdrawable, although enclosed in c.j.s. (close joint slip) tube of $\frac{5}{8}$ in. diameter for 3/·029 lighting circuits and of $\frac{3}{4}$ in. diameter for 7/·029 heating circuits, v.i.r. cable being provided in both instancees, twin p.v.c. insulated wire similarly enclosed being used for door-bell circuits.

It is most unusual to have a withdrawable job carried out in slip tubing. The demand has been satisfied by eliminating elbows and tees entirely. Instead, the tubing is itself bent as needed on site to 4 in. minimum radius (with the aid of a simple machine clamped to a trestle and hand operated) and coupled with adaptable through and multiple-way boxes where needed. Power & Son are making their own boxes, rectangular pressings with bushed nipple entries, in two sizes only: 4 by 4 in. and 6 by 6 in. Their depth of 2·25 in. allows sufficient projection through wall plaster to permit of the attachment of trunking to the box for preserving continuity. There is a meter board over the top of the service intake box under the staircase in the hall, whence a 7/·036 earthing conductor is taken in slip tubing straight up the dividing wall into the loft and bonded to the rising water main and service tank.

Similarly mounted trunking on another multiple-way box in a wall recess across the hall carries the lighting circuit splitter and separate fuse and switch boxes for the lighting and heating sub-circuits. The latter include connections for the cooker in the kitchenette directly behind the hall (gas piping being also installed) and an immersion heater for the bathroom cylinder above. The hot water piping and storage cylinder are made of copper.

There is one 15-A switched socket outlet well above the skirting in each of the rooms, including the bedrooms, with provision for inset radiant fires if chosen. Also there is a 2-A socket outlet for a bedlight in each of the upper rooms, in addition to the usual ceiling rose, all looped in and positioned as directed by the borough surveyor.

But on other sites where a.c. services will be available, it is Messrs. Power's intention to adopt the ring-main system of house wiring and to provide 3-kW socket outlets made by D S Plugs, Ltd., incorporating a three-pin fused plug.

Rolling-Mill Drives

RECENT developments in a.c. and d.c. drives for rolling mills and auxiliary machinery were the subject of an address to members of Cleveland Institution of Engineers at Middlesbrough on February 3rd by MR. H. NEILSON (G.E.C.), who said he did not think any manufacturers could claim any startling improvements in design and manufacture of large rolling mill motors, but the newer insulating materials would play their parts in the production of even more reliable machines.

One development which he welcomed was the individual top and bottom roll drive which, if anything, eased the conditions for electrical manufacturers in that each machine was smaller and no difficulties were expected in producing machines of the required diameter or to ensure proper load balance or even out of balance if required. From the mechanical point of view the omission of the pinion drive was a great advantage, both with regard to capital expenditure and maintenance.

On the last stands of a tandem cold mill there was very great pressure between the rolls, even with no metal between rolls and, with a pinion drive, any slight difference between working roll diameters would cause the rolls to grind each other and thus spoil their surface, which it was so important to avoid. With independent top and bottom roll drives and cross-connected fields, the motors would automatically adjust their speeds to run at the same peripheral speed. For such mills, due to the increasing strip speeds and power required, the stands were being matched mechanically and electrically. The motors driving the individual stands were, so far as was possible, directly coupled to the stands and designed to match. Thus the full-load torque required to accelerate each motor and its stand to full speed in a given time was made approximately the same for all stands.

Speed regulation was reduced to the minimum for all strip speeds from full down to thread. This was at first accomplished by providing special boosters but the latest tendency was to eliminate them and provide separate generators for each stand, which was a much more flexible arrangement. The voltage could be chosen to suit each stand and part of the speed range could be obtained by Ward-Leonard control if required.

There was an increasing tendency to consider the electronic control of the fields of large generators and motors. It offered high amplification and fast response, eliminating the necessity for having a host of small rotating machines, such as exciters and motors for driving them.

Referring to auxiliary drives, Mr. Neilson said that for future installations he had no doubt that consideration would have to be given to d.c. motors under Ward-Leonard control. By that means the stored energy of metal, roll and motor armature, would be returned to the line by regenerative braking, whereas with a.c. this energy had to be dissipated within the totally enclosed motors, resulting in higher temperature rise. For such machines it might be advantageous to use " Metrosil " or similar variable resistance material in place of normal discharge resistances. As they were compact and reliable, they could be placed inside the machine or terminal cover and in that way eliminate discharge energy from the external cables.

Radio-Communication Convention

ARRANGED by the Institution of Electrical Engineers, a radio-communication convention, with special reference to wartime activities and their possible influence on peacetime developments, is to take place in London from March 25th to 28th.

The opening ceremony on the Tuesday evening will be performed by Sir Stafford Cripps (Board of Trade) and an introductory address is to be delivered by Col. Sir Stanley Angwin (Cable & Wireless, Ltd.), until lately engineer-in-chief of the G.P.O.

There will be morning, afternoon and evening sessions, each devoted to a different branch of the main subject, on the Wednesday, Thursday and Friday with an additional evening meeting on April 2nd.

CORRESPONDENCE

Letters must bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

What is Ohm's Law?

MR. STUBBINGS in his very interesting article on Ohm's Law uses the expression: $I = E/R$. Since Ohm's researches showed that a direct current through a conductor, under constant conditions, was proportional to the difference of potential across that conductor, I suggest his law should be expressed as: $I = V/R$. According to the B.S.I. Glossary, V is the symbol for potential difference. Furthermore, by stating the law in this form, it can be applied to any part of a circuit, e.g., to calculate the voltage drop in a cable carrying direct current.

It is important that students should be taught this law in its most general and useful form and that the difference between "p.d." and "e.m.f." should be emphasized.

I also notice that Mr. Stubbings uses the term "pressure" for "voltage" or "p.d." There is no reference to this use of "pressure" in the Glossary, and I suggest that the term should be regarded as obsolete.

EDWARD HUGHES.

Brighton Technical College.

[In illustration of Dr. Hughes' last point, it was recently shown in this journal that confusion might easily follow the use of the term "pressure" when "voltage" was meant with reference to the design of cables, in which both pressure in lb per sq in. and voltage may be closely-related critical factors.—*Editors, Electrical Review.*]

THE article by G. W. Stubbings in your issue of January 31st is the third occasion to my knowledge that the subject has been discussed in the technical Press. The first, in December, 1913, followed the discussion on Mr. S. Evershed's paper on "The Characteristics of Insulation Resistance," at which one of the speakers remarked that dielectrics did not obey Ohm's law. This immediately brought a rebuke from Dr. Silvanus Thompson that all substances obeyed this law.

Subsequently a lengthy and highly controversial correspondence took place in the columns of the *Electrician*, between Silvanus Thompson and Sir Richard Glazebrook (then Director of the National Physical Laboratory). Thompson maintained that Ohm's law defined the resistance of a substance as the ratio of the potential difference to the resulting current, whereas Glazebrook maintained that it was a statement defining the relationship between the three quantities involved which incidentally only held good for metallic conductors. Both quoted at length from Ohm's original writings and neither would give way.

During two years at Finsbury (1909-11) I do not recollect Dr. Thompson ever impressing his view of this law on his students, and we were taught that the current in an electrical circuit was directly proportional to the e.m.f. and inversely to the resistance.

The second discussion was in the correspondence columns of the *Electrical Review* in May and June, 1934, when I pointed out that the matter had been pretty exhaustively treated in 1913-14 without any agreement being reached.

I doubt whether what Ohm intended to imply will ever be satisfactorily settled; if it is it will be only by careful research into his writings by someone with a very thorough knowledge of German. That this law, as usually understood, has certain limitations, does not appear a serious difficulty. In most branches of physics we are accustomed to ideal laws which are not strictly obeyed in practice—two examples at random are the gas laws and Hooke's law—so that the fact that Ohm's law applies only to metallic conductors maintained at constant temperature need not be a great stumbling block to students. If Thompson's view of this law were generally accepted, it would appear to lose a great deal of its value.

Carlisle. J. F. PERRIN.

Steam Generation

WITH reference to the review of Mr. J. N. Williams's book on steam generation in your issue of January 24th, as good a circulation can be obtained in tank boilers as in the water-tube type. The reason for the poor circulation in them is that the downward stream is not separated from the upward, and hence the steam bubbles have to find their way upward by bubbling through the water. Also the steam is not washed off the heating surface when in a nascent state but sticks and acts as lagging, which prevents the quick flow of heat through the metal.

Years ago I experimented with models and

found that the dense water would flow down down-corners at a great speed and this caused the water, inflated with steam, to rush upwards over the heating surface, when it absorbed heat efficiently and the steam was given up where the current turned downwards without priming.

On big American locomotives the boilers evaporate over 100,000 lb per hr, because the shaking of the boiler causes the steam to be wiped off the heating surface as fast as it is formed. Such a boiler is very small compared with a fixed tank boiler which can evaporate some 15,000 lb; indeed the loco boiler would burn out if forced to its existing output when fixed rigidly. A recent ship, of very moderate power, has five large tank boilers, but four with downcomers would serve.

Tynemouth. C. TURNBULL.

Stand-by Plant

IN the Parliamentary news report in your issue of January 31st, it was stated that Mr. Shinwell expressed surprise that there were idle generators that could be made available for immediate use. A very large number of stand-by generators is installed up and down the country in various factories, water works, sewage works, aerodromes, and even some cinemas for the very purpose of avoiding supply failure. Some of these could at least supply their own loads, but at present they are used only during local failure.

It might not pay their owners to use these plants under their existing tariffs, but it would surely warm the hearts of British housewives to hear a broadcast appeal to the owners of these sets to run them; it might ease the grid and, as most of these sets are Diesel-driven, it might help in regard to the fuel shortage too.

London, N. 15. GEORGE E. CHALK.

Shoddy Appliances

MR. SHINWELL, in a speech which he made in the House of Commons on February 3rd, attempted to defend certain powers which he seeks through the Electricity Bill by stating that a large quantity of shoddy and even unsafe apparatus is on sale in shops throughout the country.

My Association, representative of electrical contractors and retailers in England, Wales and Ireland, desires to lodge an emphatic protest at such a wholesale condemnation of the legitimate and reputable electrical contractor and retailer. It is true that a large number of unqualified people who have entered the industry sell such appliances, but the fact that they are able to do so has been a matter of protest during the last two or three years by my Association and indeed by the electrical industry as a whole.

My Association has sought to persuade the Board of Trade to take action in this matter; it has represented that valuable raw material has been made available for the manufacture of a large amount of electrical merchandise, which to say the least is shoddy and in many cases even dangerous. It has deplored the fact that valuable labour has been utilized in the production of such apparatus, when the raw material used and the labour expended upon it could have been effectively directed to the manufacture of sound and safe apparatus.

These representations have been rejected completely. Strange it is, therefore, that Mr. Shinwell should now use as an excuse for the powers he seeks a situation which the Government had it within its power to control, but in respect of which no action has been taken.

London, W.C.2. L. C. PENWILL,
Director and Secretary,
Electrical Contractors' Association.

Contractors' Guarantees

AUTOMATIC protection against bad materials and workmanship is now available to customers of members of the Electrical Contractors' Association and its associated organization the N.E.C.T.A., Ltd., as a result of a guarantee of works scheme put into force recently. The scheme may be summarized as follows:—

The standards of good workmanship and material are those which comply with the I.E.E. Regulations—unless any modifications are approved for a given class of work. If a customer considers that the quality of materials and/or workmanship of an installation is not in accordance with the standards laid down, he can make a claim on the N.E.C.T.A., Ltd., when the Association will appoint an engineer to inspect, and report upon, the work. If an adverse report is received, the Association will cause the defects to be rectified.

The conditions under which the scheme is operated are:—(1) A claim must be notified to the secretary of the N.E.C.T.A., Ltd., within twelve months of the completion of the installation; (2) Liability of the Association to any one client of a member is limited to £500; (3) If the report of the inspecting engineer reveals that the complaint was unjustified, the costs of the investigation must be paid by the customer; (4) Indirect or consequential damage is not covered by the scheme.

COMMERCE and INDUSTRY

Proposed 1951 Exhibition. Factories in Development Areas.

THE Royal Society of Arts, which promoted the Great Exhibition of 1851, proposes to mark its centenary by holding a similar exhibition in 1951, and a conference was held in the hall of the Society on February 6th to sound public opinion on the proposals for an International Exhibition. The conference was presided over by Lord Bennett, the Society's president, and was attended by delegates from 135 organizations. No formal decision was reached and no resolutions were put forward.

Most of the speakers who took part in the discussion were in favour of such an exhibition and thought that it should be held as soon as practicable, but some expressed the opinion that 1951 would be too soon. The main objections to the date were that the labour and materials required for such a large undertaking might hamper the housing programme. There was also divergence of view as to the suitability of Hyde Park (the proposed site), mainly on the grounds that this London "lung" would be lost to the public for two or three years and also that adequate transport facilities might prove difficult. Some support was given to a suggestion that a site on the south bank of the Thames would be more suitable.

Professional Engineers' Appointments Bureau

During 1946 the average number of engineers on the Register of the Professional Engineers' Appointments Bureau, 13, Victoria Street, S.W.1, was 964—184 of these being primarily civil, 390 mechanical and 390 electrical engineers. Employers have supported the Bureau well by notifying 1,155 vacancies during the year, a number of the applications being for more than one engineer. In general, nominations have been made within seven days of the vacancy being notified. At least 217 engineers have obtained posts with the employers to whom they were nominated by the Bureau, and at least a further 158 engineers were offered posts which for various reasons they did not accept.

Factory Development

At a Press conference held in London last week, Mr. J. W. Belcher, Parliamentary Secretary to the Board of Trade, gave some particulars of the progress made in the establishment of factories in the Development Areas. He said that the Government's efforts to encourage manufacturers to establish factories in these areas had been so successful that the number of applications was greater than could at present be dealt with. Up to December 31st, 1946, approval had been given to 2,736 schemes for new factories and extensions to existing factories, which would ultimately employ 188,000 men and 176,000 women. The total estimated cost of these schemes was £117 million. In the Development Areas building work had begun on 423 of the schemes and seventy-one had been completed. Most of the Development Areas would be completed by the end of 1948, and a substantial part of them would be completed by the end of the current year.

Government Factories Allocated

Among a further list of fifty-eight Government factories allocated to private industry are the following:—Kidbrooke, Foxboro-Yoxall, Ltd. (instruments), Brentwood Transformers, Ltd. (transformers), Johnson & Phillips, Ltd. (switchgear and transformers); Perivale, Marconi-Osram Valve Co., Ltd. (valves); Airport factory, Rochester (Short Bros.), B. & P. Swift and Elliott Bros., Ltd. (electrical measuring instruments, etc.); Rochester (Short Bros.), C.A.V., Ltd. (electric and fuel injection equipment); Highgate, N.19, Tungsten Manufacturing Co., Ltd. (tungsten wire); Rugby, British Thomson-Houston Co., Ltd. (control gear and light electrical devices); Chadderton, Lancs., A. C. Cossor, Ltd. (radio equipment); Hamilton, Lanarkshire, Scottish Industrial Estates, for sub-letting to Philips Lamps, Ltd. (radio sets and components); and Ilford, Plessey Co., Ltd. (meters, f.h.p. motors and radio components).

E.D.A. Annual Meeting

The annual meeting of the British Electrical Development Association is to be held at the Connaught Rooms, London, W.C.2, on March 21st. It will be preceded by a luncheon at which the President, Lord Brabazon, will take the chair.

British Refrigeration Association

Mr. Hugh Dalton, the Chancellor of the Exchequer, is to be the principal guest at the annual luncheon of the British Refrigeration Association at the Connaught Rooms, London, W.C.2, next Thursday, the 19th.

Electricity Workers' Insurance

The Ministry of National Insurance has informed the National Joint Industrial Council for the Electricity Supply Industry that in view of the holiday agreement operative from April 1st, 1946, and having regard to the recent decisions of the umpire under the Unemployment Insurance Act, 1935, the rulings to the effect that in the electricity supply industry contributions to the National Health & Pensions and Unemployment Insurance were not payable

either by employer or employee during a complete week's holiday have been cancelled. From January 30th, 1947, therefore, contributions are payable for holiday periods for all workers in the electricity supply industry who are ordinarily insurable.

Small Builders and Housing

Measures to ensure that the small builder and specialist firm are used to the full in the housing programme are described by the Minister of Health in a letter to housing authorities. He says that the present restrictions on the issue of building licences are intended to divert building labour from repair and maintenance work into construction of new houses and other priority work. Referring to sub-contracting, the Minister says that sub-contracting to certain specialist firms has always been a recognized practice in the construction of new houses, and it is desirable now that this should be extended to the furthest possible limits. There are a number of small firms who could be used as sub-contractors on electrical work, glazing, joinery, bricklaying, plastering, plumbing, painting or decorating. Every effort should be made to bring such small firms into contact with the main contractors where there is a general shortage of skilled craftsmen.

Radio and Radar Equipment Sale

Goddard & Smith have been nominated to inaugurate on behalf of the Ministry of Supply a series of sales by auction of radio and radar equipment including a large variety of accessories and component parts. The initial sales will be held on Wednesdays, February 19th, March 5th and 19th, and April 9th, at the Ministry of Supply Stores at Aldenham on the Watford By Pass just past the junction with the Edgware-Elstree Road. No catalogues will be issued but the goods will be on view on each sale day from 9 a.m. till 11 a.m when the auction will commence. Goods will be sold " as they lie " and may be cleared immediately after each sale or on either of the two succeeding days.

B.B.C. Brookman's Park Radiator

On the loading-coil platform of the recently erected B.B.C. radiator at Brookman's Park (*Electrical Review*, October 25th, 1946), standard 0·0225 sq in. four-core " Pyrotenax " mineral-insulated copper-sheathed cable is wound into a helix of fifteen turns of 26 in. diameter. The base of this coil is bonded to the top of the 400-ft mast, whilst the head is bonded to the base of the 100-ft mast. This helix is used as a loading coil, the sheath carrying 50 A at radio frequency, while two of the four cores feed the top riser to the obstruction light and the other two provide the connection between the telephone circuit on the 400-ft mast and that on the 100-ft mast.

Pyrotenax cable is also utilized to feed the ten aircraft obstruction lights on the radiator and to connect the telephone points between the base and the 400-ft and 500-ft levels. Two twin-core 0·0145 sq in. main risers are run from the base to the 400-ft platform, and are tapped at the 125-ft, 250-ft and 375-ft levels for feeding laterals which supply the obstruction lights. These risers terminate in a junction box on the loading-coil platform, and a further twin-core 0·0145 sq in. riser feeds the light at the 500-ft level. Communication is provided by running twin-core 0·0015 sq. in. cable from the base to the radiator head, tapping in at the platform level for a further telephone.

Instrument Research

New research laboratories have been established by Elliott Brothers (London), Ltd., at Borehamwood in a modern building of 50,000 sq ft floor area for the purpose of developing all types of industrial and laboratory instruments and specialized equipment and new techniques for the control of manufacturing processes. The laboratories are in the charge of Mr. J. F. Coales, O.B.E., M.A., M.I.E.E., late of the Admiralty Signal Establishment, where from 1930 to 1937 he was engaged on research into radio direction finding to which subject he made a number of original contributions. He was later in charge of a radar research team working on decimetre waves, and throughout the war was responsible for the development of all radar for gunnery purposes in H.M. ships.

Gauge and Tool Makers' Association

The Gauge and Tool Makers' Association is arranging a convention for its members and their business friends in the form of a long week-end at Bournemouth. The convention will open on Friday evening, June 6th, with a cocktail reception followed by a dinner and dance, and will close with a dinner on the Sunday evening. A visit to the Paris International Fair is again being arranged, from May 17th to 20th.

Siemens Concern Taken Over

A *Reuter* message from Berlin states that the British Military Government has taken over the Siemens electrical concern in Berlin under the provisions of Occupation Law 52 (which deals with the blocking and control of property of interest to the United Nations).

Custodians have been appointed with instructions to prepare a complete report on the assets and affairs of this industrial combine which before the war employed 250,000 Berlin workers and controlled the major part of the German electrical industry. Before closing down, shortly before Christmas, through lack of fuel, 18,000 workers were employed. Although the concern is now under British Military Government control, it may continue to carry on its normal

usiness but it is stated at the factory that they re still uncertain when work can be resumed ecause of continued lack of fuel. When the ctory does reopen, however, Siemens will be rbidden to undertake any financial transaction nvolving the firm's capital. Siemens, with its ain subsidiary (Siemens-Schuckert) is among he big Berlin industrial concerns scheduled by he City Council (which has a Socialist majority) r municipalization.

Birmingham Electricity Cuts

Mr. F. W. Lawton, chief engineer and anager of the Birmingham Electric Supply Department, has sent us a copy of a plan which he Department is advertising in the local ress for reducing factory load cuts. The otice points out that the closing of factories nd shops for one day a week will not make hem immune from electricity cuts on other ays, unless the total power demand each day s within the capacity of the generating plant. It is suggested, therefore, that all factories in the Birmingham and Midland area should stagger the closed day, the day selected being arranged in alphabetical order of the names of the firms. If this plan is adopted by all local firms, it is hoped to reduce the present load cuts on other days in the week. Firms are asked to notify the Electricity Department as and when they adopt short-time work, stating which is their closed day and, if possible, the saving of load effected. The notice suggests that the national adoption of this plan would go a long way towards relieving the present power supply difficulties.

Municipal Trading at Coventry

The Coventry City Council last week discussed the question of the sale and servicing of radio and television equipment through its Electricity Department. Radio and electrical retailers had submitted a memorial protesting against entry of the Corporation into competition with the private trader. The non-Labour members of the Council urged that the project was both unfair to the ratepayers and unsound. Strong criticism was made of the proposal to take up 750 radio receivers costing £17,000, although the name of the manufacturer was being concealed. Eventually the Council agreed to the proposal to sell and service such equipment.

Chinese Import Surcharge

Mr. T. V. Soong, the Chinese Premier, announced last week that from February 6th, at least 40 per cent of all goods imported into China would be subject to a new surcharge of 50 per cent. However, capital goods and certain " necessities " would be exempt from the surcharge. The exempted capital goods include electrical machinery for power generation and transmission, such as dynamos, motors, transformers, convertors, etc., and parts; machine tools and machine shop tools and parts; gas engines, oil engines, steam engines, hydraulic turbines, steam turbines, turbo-generator sets and other prime movers, combined with generators or not, and parts; railway and tramway supplies; steam boilers, economisers, superheaters, mechanical stokers and other boiler room accessories and parts. The new tax is to provide funds for a bonus of 100 per cent of the f.o.b. value of goods sent out of China to be paid to exporters to encourage export trade.—*Reuter's Trade Service.*

Exhibition of Hospital Appliances

An exhibition of labour saving devices for use in hospitals, organized on behalf of the Ministry of Health by the British Electrical Development Association with the co-operation of the British Gas Council, is to be held at the Empire Tea Centre, 22, Regent Street, S.W.1, from February 19th to March 8th. The exhibition will be officially opened by the Minister of Health, Mr. Aneurin Bevan. Its main purpose is to give hospital authorities the opportunity of seeing new labour-saving and welfare equipment for their domestic staff.

Radar Equipment Contract

The Mersey Docks and Harbour Board has placed a contract with the Sperry Gyroscope Co., Ltd., of Brentwood, for the installation of radar equipment at the seaward end of the Liverpool docks system. The equipment will include an aerial scanner weighing two tons, rotating at the top of an 80-ft steel tower. The installation is due to be completed in the spring of 1948.

Kent Colliery Electrification

It is reported by the *Kent Messenger* that the management of Chislet Colliery, Kent, has drawn up a " five-year plan " for the re-equipment of the colliery involving an expenditure of £250,000. Operation will be all-electric and it is anticipated that the output will be increased from 6,500 to 15,000 tons a week when the work is completed.

Fluorescent-Lamp Chokes

The physical dimensions of the control chokes for 80-W fluorescent lamps made by Simmonds Bros., Bedcote Mill, Birmingham Street, Stourbridge, Worcs, are 3⅛ by 2 by 6in. or 7 in. long over the fixing lugs, not as wrongly stated in our January 24th issue (page 183).

Goods Transport Guide

A new issue, dated January, 1947, is now available of the *Motor Transport* " Goods Guide," which resumes six-monthly publication after appearing every nine months during the war years. Since the last issue long-distance goods service operators have regained their freedom from the Ministry of Transport's Road

Haulage Organization, and there has been a general revision to pre-control services. The "Goods Guide" provides a comprehensive and up-to-date survey and index of services operating in England, Scotland and Wales, a new feature being an indication of the exact type of vehicle operated by each owner. Detailed information is also given on vehicle loading, clearing houses and specialized carriers of all types. The Guide is obtainable at 1s. 6d. post free from the Publishing Department, Dorset House, Stamford Street, London, S.E.1.

Trade Publications

Siemens Electric Lamps & Supplies, Ltd., 38, Upper Thames Street, London, E.C.4.—Illustrated list (Z.146) with price sheet of house-service cutouts and power fuse boxes of various types and sizes in bakelite, cast iron and watertight patterns.

Bowthorpe Electric Co., Ltd., Goodtric Works, Brewer Street, Oxford.—Illustrated leaflet on continuity tester and insulation "Testometer."

Standard Telephones & Cables, Ltd., Oakleigh Road, New Southgate, London, N.11.—Leaflet on 25-line P.A.X. telephone exchange.

Five-Day Week

Following the introduction of a five-day working week in its factories, similar arrangements have now been made in all the offices of the British Thomson-Houston Co., Ltd.

Calendars, etc.

E.M.F. (Electrical), Ltd., has sent us a handy engagements pad, with one week to each sheet.

The calendar received from Clang, Ltd., has monthly slips, showing also the previous and following months, mounted on a card with illustrations of some of the company's products.

Catalogues Wanted

Bee Appliances, Ltd., Hambleton, near Blackpool, invite manufacturers and merchants to forward catalogues of their productions, particularly agricultural electrical equipment.

Trade Announcements

E. Bridges & Co., Ltd., 1, Shortlands Road, Kingston-onThames, have been taken over by Metalcraft Manufacturing Co. (Canada), Ltd., which, with the added facilities afforded, will continue to manufacture lighting and heating equipment, etc., and also undertake any form of metal work.

Electrical Components, Ltd., have reopened their branch at Poole Buildings, Stockton Street, Middlesbrough (Telephone: Middlesbrough 2114) under the management of Mr. K. H. Forster.

Mr. W. H. Hind has commenced business at 155, Duke Street, Liverpool, 1, as an electrical engineer and contractor, specializing in the installation and equipment of theatre, cinema, and stage lighting installations, equipment and maintenance. He asks for catalogues, lists, etc.

Simmonds Aerocessories, Ltd., has moved to Treforest both its head office organization and its research departments. The London office at 2 and 3, Norfolk Street, Strand, and the regional offices are unaffected by this change but the head office address will be Simmonds Aerocessories, Ltd., Treforest, Near Pontypridd, Glamorgan.

Gillott Electro-Steam Cookers, Ltd., have moved to Cotswold Works, Chalford, near Stroud, Glos. (telephone: Brimscombe 2276-7); telegraphic address: Elecsteam, Chalford).

Trade Marks

THE following applications have been made for the registration of trade marks. Objections may be entered within a month of February 5th:—

DYNO-LUXE. No. 642,707, Class 7. Dynamos. To be associated with No. 642,708 xi and another. Also No. 642,708, Class 11. Lamps for vehicles. To be associated with No. 642,707 (3593) vii and another.—The Raleigh Cycle Co., Ltd., 177, Lenton Boulevard, Nottingham.

ORTYX. No. 638,742, Class 9. Electric flat irons. Also No 638,744, Class 14. Electric clocks.—John Hamilton Lundy, 6, Wheatley Street, London, W.1.

CASCO. No. 641,166, Class 9. Electric cigar lighters, electric signals, rheostats, electric generator regulators, electric irons, and electric coffee makers.—Casco Products Corporation Bridgeport, Connecticut, U.S.A. Address for service is c/o Marks & Clerk, 57-8, Lincoln's Inn Fields, London, W.C.2.

WESTOX. No. 643,169, Class 9. Alternating electric current rectifiers, and parts thereof and fittings therefor, none being included in other classes.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1. To be associated with No. 601,552 (3173) ix and others.

PLESSEX. No. 644,377, Class 9. Electrical apparatus and instruments included in Class 9.—The Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

MAXI-Q. No. 644,809. Radio induction coils. Also DENCO. No. 644,275, Class 9. Wireless receivers and transmitters.—Denco (Clacton), Ltd., 357 to 359, Old Road, Clacton-on-Sea.

HUGH BROSSE. No. B644,216, Class 11. Electric lighting installations, electric lighting fittings, electric cooking and heating apparatus, gas lighting installations, gas lighting fittings included in Class 11, gas cooking and heating apparatus, and parts (not included in other classes) of all such goods.—Hugh Brosse, Hong Kong Works, Southway, Trading Estate, Wembley, Middlesex.

Thermo-Variable Resistors

Negative Characteristics of "Urdox" Regulators and Dampers

By C. C. Roloff

THE large negative temperature coefficient of magnesium-titanium-spinell, which is normally an insulating substance commercially named "Urdox," causes it to become semi-conductive when reduced by heat treatment. The influence of temperature above 400 deg C on the reduction of the volume resistivity (Fig. 1) may be expressed by the exponential formula $\delta = a\,c^{\frac{-b}{t}}$ when δ is the conductivity (logarithmic, ordinates) and t is the absolute temperature (reciprocals, abscissa) while a and b are constants and c is the base of natural logarithms.

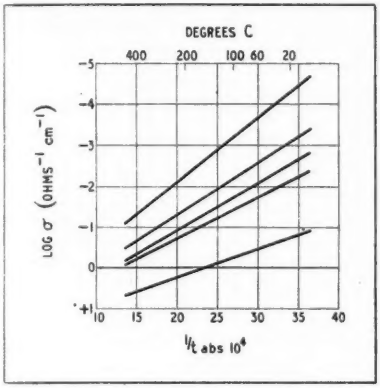


Fig. 1.—Relationship between conductivity and pre-heating temperature

Elevation of the reducing temperature improves the electrical conductivity, reducing b for less steep inclination of the straight-line graph. The resulting values are definitely repeatable when the element is protected against oxidation. It is thus possible to construct a resistor that can be varied in value thermally without any sliding contact, which is disturbing, whereas a pre-heater for indirect regulation can be made electrically separate from the resistor to be controlled.

The whole assembly is sealed into a glass envelope (Fig. 2) which is mounted on a base similarly to a thermionic valve; a glass pinch-foot likewise supports the dual circuit elements. One of the latter is a tungsten heater filament of hairpin shape and insulated throughout its entire length, to concentrate the generation of heat at its bent extremity, which is inserted into a vertical surrounding cylinder of "Urdox" about 5 mm long with an exposed portion about 2 mm long between its terminal clips. The internal diameter is not more than 1 mm, to avoid convection currents

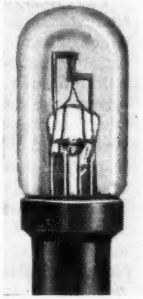


Fig. 2.—Glass-bulb "Urdox" resistor, Continental pattern

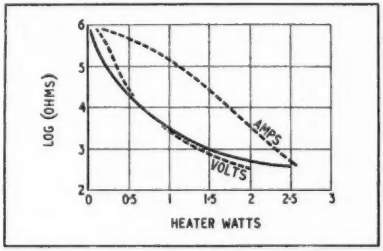
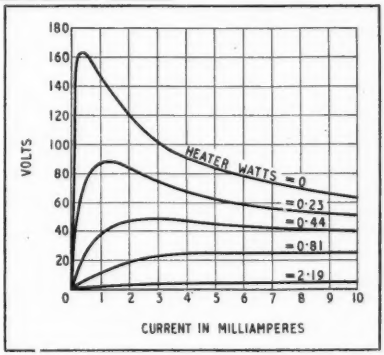


Fig. 3.—Logarithmic dependence of resistance on heat absorption

Fig. 4.—Drooping characteristic curves



interfering with the conduction of radiated heat through the hydrogen gas which fills the glass envelope.

The resistor responds quickly to quite small changes of filament temperature, which is controlled by means of an external variable resistance in series with the filament.

Minimum resistance of the thin " Urdox " tube, of the stated dimensions when hydrogen filled, corresponds to a filament input of 2·5 W at 4 V (Fig. 3) which heating energy might be reduced to one-quarter with nitrogen filling and to some lesser value in vacuum, but the ratio is uncertain.

A range of almost 10^4 is easily covered, but the maximum load of a resistor of this particular size is 10 mA, or not more than 100 V between its terminal clips, since current limits voltage and *vice versa*, because the material has a drooping characteristic (Fig. 4) which is pronounced at low temperature, becoming flatter with increasing heat input.

Perhaps end-cooling of the resistor influences the shape of the falling portions

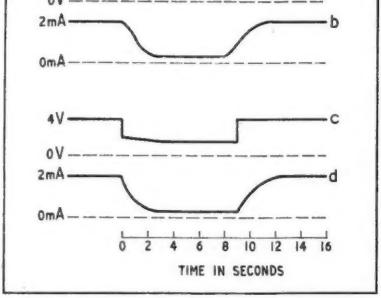


Fig. 5.—Resistor response to change of heat input
ac = heater voltage
bd = resistor current

of the curves, the metal terminal clips causing a temperature gradient longitudinally from the hot middle towards the ends of the cylinder. The influence of the radial temperature gradient and its variation with heat input is of very subordinate importance to the shape of the graph.

Thus, to stabilize a definite value at a particular point on the falling curve, the cylinder voltage and series regulating resistance need to be appropriately selected. The inertia of the system can be made very small by choice of element spacing and cooling conditions, so that resistor variation will follow change of heat input with extraordinary rapidity. Fig. 5 represents oscillograms of the effect of gradual and sudden diminution of filament temperature

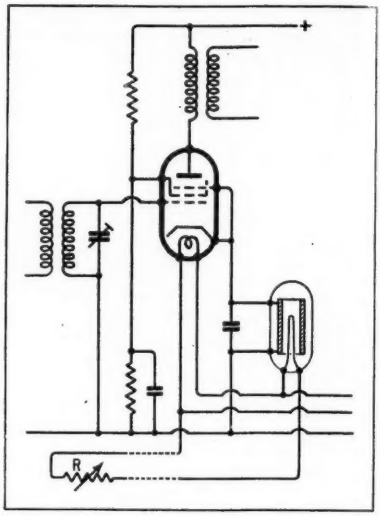


Fig. 6.—Regulator associated with high-frequency amplifier

on current passage through the resistor cylinder, the response delay being less than two seconds.

The spacing of the heater filament and cylindrical resistor is adjusted so that the capacity between them is less than $2 \cdot 10^{-12}$ farad, thus rendering " Urdox " particularly suitable for employment in high-frequency circuits. For example (Fig. 6) a resistor of this type in the cathode circuit of a 5-pin screen grid valve functioning as a high frequency amplifier will serve to adjust the valve grid voltage, thereby controlling the degree of amplification.

Incidentally control can be exercised in this way from a distance, if desired, simply by accommodating the regulating resistance R (in series with the heater) separately from the amplifier, so that all high frequency circuits can remain inside the amplifier.

In addition to their use as variable remote control resistors, semi-conductive substances can also be utilized for damping excessive starting currents as well as for the automatic retardation of switching processes.

Town and Country Planning

How the New Bill Affects Statutory Undertakers

By Leslie F. Stemp, B.A., LL.B., *Barrister-at-Law*

A FEW days before Christmas, 1946, the Government introduced into the House of Commons the Town and Country Planning Bill which has now received a second reading. This is one of the most complicated measures introduced by the present Government and there will be considerable sympathy with the complaint made by the Opposition that too little time has been allowed to Members of Parliament and the general public to familiarize themselves with the main provisions of the Bill. The Bill represents the Government's policy with regard to land and is to a large extent an alternative to land nationalization which has long been advocated by many Socialists.

Generally speaking, the Bill sweeps away all existing town and country planning legislation together with much of the carefully considered and agreed protection afforded to public utility undertakers in those measures. It is not the intention of these notes to attempt any comprehensive explanation of the system of control devised by the Bill or to deal in detail with development charges or payments to be made in respect of the depreciation of land values. These questions are of interest to the general body of landowners: the present purpose is merely to call attention to those parts of the Bill which affect in particular the rights of statutory public utility undertakers.

Existing Legislation

At present Planning Authorities rely mainly upon three Acts for their powers. The Town and Country Planning Act, 1932, deals with the making of town and country planning schemes, and Section 41 stipulates that no provision of a town and country planning scheme shall apply to any land or building erected thereon which belongs to statutory undertakers and is held or used by them for the purpose of their undertaking, without the consent of such undertakers, which is not to be unreasonably withheld. The Act is repealed *in toto* by the Bill.

The Town and Country Planning Act, 1944, provides for the clearing of " blitzed " and " blighted " sites. There is special machinery in Section 13 of the Act relating to the compulsory purchase of public utility land. These sections will, however, be repealed and the procedure contained in the new Bill will be substituted. Certain other portions of the Act mentioned below will, however, be retained.

Under the Town and Country Planning (Interim Development) Act, 1943, the General Interim Development Order has been made. This contains special provisions regarding interim development on the land of gas, water and electricity undertakings. This Act, together with the related Order, will be repealed.

Development Plan

The new Bill vests the function of Local Planning Authorities in the councils of counties and county boroughs, but these Authorities may delegate certain of their executive duties to the councils of county districts. It will be the duty of Local Planning Authorities, within three years of the passing of the new Act, to formulate a Development Plan which will indicate how the Authorities propose that the land in their areas shall be used and the stages by which the Plan is to be carried out. The Plan will not itself impose any restriction or confer any power, but is intended merely to form the basis for the control of development and is therefore comparable rather with the form of interim development control than to a town and country planning scheme.

Although the Plan is to be regarded as a mere guide, it is, for reasons which will become apparent, essential that public utility undertakers should be familiar with the contents of the Plan and should have the right to make representations against any proposals which may be to their detriment. Although the Bill provides that the Plan is to require the approval of the Minister of Town and Country Planning, the actual procedure for the making of the Plan is to be dealt with by regulations, and it will therefore be essential that public utility undertakers shall be assured that the regulations are such as to allow them to bring any submission which they desire to make against the Plan before the Minister.

After the day to be appointed by the Act, no development will be allowed without the permission of the Local Planning Authority. It is important to note carefully the definition of " development " contained in Clause 10 of the Bill, which includes the carrying out of building, engineering, mining or other operations in, on, over or under land, and the making of any material change in the use of any building or other land. Certain operations are, however, specifically excluded from the definition, such as (*a*) work for the maintenance of any building not being works which materially affect the design or external appearance of the building, and (*b*) in the case of buildings or land which are used for any purpose specified in an Order made by the Minister, the use thereof for any other purpose of the same class.

In dealing with applications for permission to develop, Planning Authorities are to have regard to the Development Plan and other material considerations but are not bound by the Plan and can refuse to give permission to applications which are in conformity with the Plan, or *vice versa*, can give permission to applications which contravene the Development Plan.

Development Orders

The Bill authorizes the Minister to make Development Orders which will either expressly grant permission to certain developments or will specify classes of development in respect of which application for permission must be made to the Local Planning Authority. Every Development Order must be laid before Parliament and is subject to a negative resolution by the House. The contents of these Orders will obviously be of the utmost importance to public utility undertakings.

At present the Town and Country Planning (General Interim Development) Order, 1945, No. 349, lays down classes of development by public utility undertakers which are free from interim-development control and there is no doubt that undertakers will desire that similar provisions shall be incorporated in Development Orders.

It should also be noted that the Board of Trade may make regulations that industrial buildings of a specified class shall be subject to a certificate from the Board of Trade that the development is consistent with the proper distribution of industry.

Part II of the Bill, which relates to planning and control of development, is to apply to the development of any land notwithstanding that provision is made in any other Act authorizing or regulating the development of the land. Special provisions regarding public utilities are, however, contained in Clause 32 of the Fifth Schedule to the Bill. The effect of this is that where the sanction of a Government Department is required in respect of development to be carried out by a local authority or statutory undertaker, that Department in granting the necessary sanction may direct that permission for the development so sanctioned shall be deemed to be granted subject to any conditions which may be specified in the direction.

The clause provides that development by a local authority or a statutory undertaker shall be deemed to be sanctioned by a Government Department if, *inter alia*, consent is granted by a Government Department in pursuance of an enactment or consent is given to the appropriation of land for the purpose of the development or to the acquisition of land by agreement for that purpose.

The provisions of the Fifth Schedule of the Bill are also important and provide, in effect, (*a*) that applications for permission to develop operational land (to be considered later) shall be dealt with by the Minister of Town and Country Planning jointly with the appropriate Minister; (*b*) that where the Ministers refuse permission or grant permission subject to unacceptable conditions their decision shall be embodied in an Order subject to special Parliamentary procedure; (*c*) that compensation may be claimed in accordance with the provisions of the Fourth Schedule of the Town and Country Planning Act, 1944, except in cases where the land was acquired after January 7th, 1947, and such compensation would be unreasonable. It may be recalled that the Fourth Schedule to the Town and Country Planning Act, 1944, was incorporated in that Act after negotiations between the Ministry and the Conjoint Conference of Public Utility Associations, and has generally been considered to be satisfactory; (*d*) where permission previously granted is to be revoked or modified, the Minister shall, if the objection of a statutory undertaker is sustained, make an Order subject to special Parliamentary procedure.

The third part of the Bill deals with compulsory purchase and it is to this part that the attention of public utilities will no doubt be most closely directed. A Development Plan

may designate certain land as subject to compulsory purchase and this land falls under the three following classifications:—(*a*) land required by the Government or local authorities or statutory undertakers for any of their functions; (*b*) land which is to be developed or redeveloped as a whole, including areas of extensive war damage or bad lay-out or obsolete development; (*c*) land which in the opinion of the Minister ought to be acquired for the purpose of ensuring that it shall be used in the manner proposed by the Plan.

In every case the Minister will have to be satisfied that the land will be required within ten years, but it is noticeable that the Bill provides for the compulsory purchase of land by statutory undertakers for any of their purposes. Operational land of public utility undertakers cannot be designated in a Development Plan without the consent of the undertakers except in pursuance of an Order made by the Minister of Town and Country Planning and the appropriate Minister and the Order will be subject to special Parliamentary procedure.

Definition of "Operational Land"

If the land of the undertakers is not operational land, then, failing agreement, such land can only be designated by an Order made by the Minister of Town and Country Planning and subject to special Parliamentary procedure. "Operational land" is defined in Clause 107 as land used for the purpose of carrying on the undertakings of any statutory undertakers and land in which an interest is held for that purpose, not being land which in respect of its nature and situation is comparable rather with land in general than with land which is used or in which interests are held for the purpose of carrying on statutory undertakings. This definition is somewhat less restricted than the corresponding definition contained in Section 34 (2) of the Town and Country Planning Act, 1944, in that it substitutes the words "nature and situation" for the words "nature or situation."

Under the wording of the Bill it will be necessary, in order to exclude land from being "operational," to show that it is comparable with land in general both with regard to its situation and also to its nature. It will not be sufficient to prove that in one only of these respects it is comparable with the surrounding land.

It has been stated above that the contents of a Development Plan have not in themselves any coercive force but are to be regarded as a general notification of intention. The actual purchase of the land must be effected by means of a Compulsory Purchase Order, but in the making of such an Order it is important to ascertain whether the land affected has been designated in the Plan as subject to compulsory purchase.

Compulsory Purchase Orders

The procedure regarding the making of a Compulsory Purchase Order will be that laid down in the Acquisition of Land (Authorisation Procedure) Act, 1946, with certain modifications which are as follows:—

(*a*) *Where the land has been designated.*

(i) Where the land has been designated in the Development Plan, it will not be necessary, on the making of a Compulsory Purchase Order, to advertise the order in the local press or to serve a notice and copy of the Order on the owners or occupiers, as required by paragraph 6, Part I of the First Schedule to the Acquisition of Land (Authorisation Procedure) Act, 1946.

(ii) It will not be necessary to obtain a certificate from the appropriate Minister under paragraph 10, Part III, First Schedule to the 1946 Act that the land can be purchased and not replaced without serious detriment to the carrying on of the undertaker, or that if purchased, it can be replaced by other land belonging to or available for acquisition by the undertakers without serious detriment to the carrying on thereof. This provision is omitted no doubt because the question will have been investigated before the land was included in the Development Plan.

(*b*) *Where the land has not been designated.*

Where the land affected has not been designated in the Development Plan, it may still be purchased without obtaining a certificate under paragraph 10, Part III, First Schedule to the 1946 Act, but if it is so purchased, the Compulsory Purchase Order must be confirmed both by the Minister of Town and Country Planning and the appropriate Minister, and the Order is to be subject to special Parliamentary procedure.

The amount of compensation will depend upon whether the certificate to which reference is made above has been granted. If the certificate has been obtained, it would appear that compensation will be on the general basis for which the Bill provides, i.e., the existing value of the land, and where com-

pensation is based on 1939 values, the 1939 development value will be excluded. On the other hand, if no certificate has been obtained, the compensation payable will be assessed under the Fourth Schedule to the Town and Country Planning Act, 1944.

Cables in Highways

The development of large areas of the country will obviously involve the stopping-up and diversion of existing highways and the construction of new highways. This will in many cases entail an alteration of the distribution system of public utility undertakers. On this aspect of the question it does not appear that the law will be altered by the new Bill. The provisions of Section 25 of the Town and Country Planning Act, 1944, will be re-enacted and undertakers will still be entitled to claim compensation under the provisions of the Fourth Schedule to the 1944 Act. These provisions, whilst satisfactory as far as they go, do not cover all cases which may arise, but on this aspect of the subject public legislation has been promised by the Government.

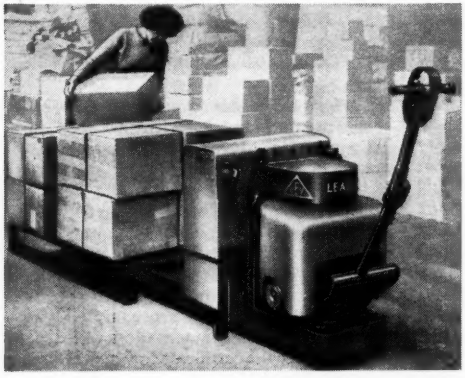
Parts IV and V of the Bill deal with payment for the depreciation of land value and the levy of development charges in respect of certain development. These provisions, although of prime importance to general landowners, do not affect the operational land of statutory undertakers (Clause 79). Where operational land ceases to be such, no development charge is payable for the use of such land in conformity with the general prevailing use of contiguous or adjacent land or for any operations necessary for that use of the land. These parts of the Bill will, however, apply to non-operational land held by public utility undertakers with respect to which their interests will no doubt be similar to those of other landowners.

Part VIII of the Bill deals with the making of Exchequer Grants to local authorities and power is given to statutory undertakers (Clause 91) as well as to local authorities to contribute towards the cost of the preparation of a Development Plan or the performance of any of their duties by Local Planning Authorities under Parts II and III of the Bill.

Lifting-Platform Truck

Battery Operated with Pedestrian Control

THE latest B.E.V. development announced by Wingrove & Rogers, Ltd., Poplar Works, Old Swan, Liverpool, is a sturdy jack truck for transporting heavy loads short distances in congested areas. Battery propulsion relieves the strain of man-handling, enabling short ramps and inclines to be negotiated with ease by one person using this "Leader" truck, so named because it is pedestrian-controlled by means of the steering handle. In the top of the latter are thumb-operated push-buttons for forward and reverse motion by contactor selection. Two speeds are obtainable in either direction by lowering or raising the steering handle beyond the braking position. The tubular steel handle is spring-loaded so that when released it automatically assumes a vertical position, thereby switching off power and applying the brake, also avoiding floor obstruction.



Pedestrian-controlled jack truck with lifting platform

The totally enclosed series-wound motor with complete driving unit is mounted on a large-diameter turntable, on ball bearings, grease lubricated, dust sealed, which is capable of 210 degrees free movement. Power is transmitted by double-reduction chain drive, the removable battery container having quick-release clamps and non-reversible plug and socket connectors.

The truck has a lifting platform, actuated by a hydraulic pump and controlled from the front by two foot pedals, for carrying 2 or 3 tons, the platform being 6·5 or 11 in. high respectively by 2 ft broad and 4 ft long. The overall length of the "header" truck is 6 ft 10·25 in.

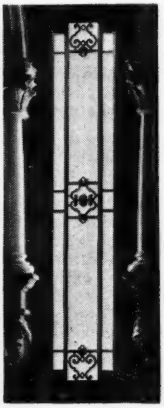
Fluorescent Lighting Installations

Two Recent Examples

A LARGE-SCALE interior lighting scheme employing fluorescent tubular lamps in decorative fittings has been installed in Chatham Town Hall. The fittings were specially designed by the General Electric Co., Ltd., and were installed by the Kent Electric Power Co. of Rochester. In the main hall are five pendants, 7 ft 9 in. in length and 3 ft 6 in. wide. They are of champagne flashed opal glass with gilt metalwork and can be lowered to floor level for lamp replacement and maintenance. Each pendant accommodates ten 5-ft " Osram " 80-W fluorescent lamps and all the auxiliary gear. There are also twelve wall fittings in recesses between the pilasters. The metalwork and glasswork match the pendants. Each of these fittings houses two 5 ft 80-W fluorescent lamps, the auxiliary gear being located remotely. In addition there are three 2-lamp fittings underneath the gallery and three one-lamp fittings over the stage. These are flush mounted on the ceilings. Metalwork and glassware are of the same kind as that employed in the other fittings in the hall.

The council chamber is illuminated by two pendants measuring 6 ft by 2 ft 6 in. These are also of gilt metalwork and champagne flashed opal glass with the addition of reeded glass and moulded glass panels. Each pendant accommodates five 5-ft 80-W fluorescent lamps. Ceiling fittings each using one 80-W fluorescent lamp, have been installed in the vestibule between the main hall and the council chamber, while fittings of similar type but each employing two 80-W fluorescent lamps are used in the main entrance.

Fluorescent lighting at the West End offices of the Norwich Union Insurance Societies, using Philips fluorescent lamps



G.E.C. specially designed fluorescent lighting fittings at Chatham Town Hall, showing (right) one of the wall fittings

Another interesting fluorescent lighting installation is that recently completed at the West End offices of the Norwich Union Insurance Societies, by H. J. Cash & Co., Ltd., under the superintendence of the Societies' Estates Department. For this installation Philips 80-W fluorescent lamps are used in G.2620 type fittings supplied by George Forrest & Son, Ltd.

Southern Rhodesia " T.V.A. " Scheme.—The Government of Southern Rhodesia is to survey the valley of the River Odzi, near the border of Portuguese East Africa, with a view to extensive irrigation and development on the lines of the Tennessee Valley Authority.—*Reuter.*

ELECTRICITY SUPPLY

Power Station Schemes. Commissioners and Lerwick Agreement.

Accrington. — NEW POWER STATION.—The Electricity Commission intimates that it is prepared to entertain the Corporation's application for consent to establish a new generating station at Huncoat, and also an application to borrow money to cover the cost (£5,000,000). Following interviews with four companies regarding the manufacture and installation of two turbine sets required for the first half of the station, the borough electrical engineer, Mr. A. Goward, and a representative of the consultants have reported that in the case of three no date for delivery could be guaranteed. The representative of the fourth had no hesitation in stating that two sets could be manufactured at the company's works and erected by the middle of 1950. The Electricity Committee recommends that a provisional contract be deferred pending further information.

Birkenhead.—VISIT TO NEW STATION SITE.—Last week members of the Electricity Committee inspected the 36-acre site for the new generating station at Bromborough. A ¾-mile concrete road has been constructed as well as railway sidings connecting with the main Birkenhead-Chester line.

Blackburn. — INAUGURATION OF POWER STATION EXTENSIONS.—Extensions at Whitebirk generating station, costing over £2,000,000 will be officially opened by Mr. George Tomlinson (Minister of Works) on March 7th, and guests will have an opportunity of visiting cotton mills and engineering works. The jubilee of the electricity undertaking will be celebrated at the same time.

EXTENSIONS.—Schemes have been approved for supplying electricity to the Waverledge housing estate, Great Harwood (£1,826), and to the Small Holdings, Whalley Road, Martholme (£1,082). The Electricity Committee recommends the reorganization of the electricity service in Great Harwood and Rishton, involving the establishment of showrooms, offices and store rooms in Queen Street.

Coventry.—HUNDRED THOUSANDTH METER.—Last week the Corporation Electricity Department installed the 100,000th meter in premises only a few yards from where the first meter was placed half a century ago.

Dewsbury.—H.V. EXTENSIONS.—The Electricity Committee is seeking sanction to a loan of £22,225 for extensions to the h.v. system.

Gravesend.—ELECTRICITY EXTENSIONS.—The Town Council has recently approved schemes for distribution system extensions and substations, at a total cost of £136,377.

Hammersmith.—LOANS.—Application is to be made for sanction to borrow £18,850 for specified mains extensions (additional supplies to United Dairies, Ltd., Hammersmith Hospital, Fullers, Ltd., and Alliance Studios, Ltd.) and £37,000 for the hire of apparatus, hire of wiring installations, meters, mains and services, switchgear and transformers, etc. Sanction has been received to borrow £16,500 and £57,466 respectively in connection with the Council's applications for £18,300 (substations and e.h.v. mains) and £66,340 (Becklow Gardens, Riverside Gardens and north-west area supply extensions).

Hull.—LOANS.—The Electricity Committee has obtained sanction to borrow £50,000 for mains and services and £3,886 for plant; and is seeking sanction to borrow £20,000 for meters.

Ilford.—EXTENSIONS.—The Electricity Committee is to provide a supply to the Maypole and Lexden estates (£9,600) and is to extend the network to Hainault substation (£3,456). Sanction has been obtained to borrow £5,435 for supplying Oaks Lane estate and £4,410 for storage accommodation.

Lerwick.—PROTEST TO COMMISSIONERS.—The Town Council is protesting against a decision of the Electricity Commissioners, who state that they cannot approve the agreement entered into recently by the North of Scotland Hydro-Electric Board and the Council on the question of compensation in return for taking over the town's electricity undertaking. The Council, in a letter of protest, say that the Commissioners, by their refusal to approve of the Board's scheme, are compelling the Board to break faith with the Council.

Mansfield. — EXTENSIONS.— The Electricity Committee is to extend the 11-kV system and erect a substation for the Mansfield Sand Co. at a cost of £3,844. Sanction has been obtained to borrow £2,578 for the improvement of the distribution network to Mansfield Colliery and £1,588 for the erection of a substation in Maltby Road.

Nelson.—NEW POWER STATION PROPOSED.—The Electricity Committee has applied to the Electricity Commission for consent to establish a new 120,000-kW power station at Nelson.

Oldham.—INDUSTRIAL SUPPLIES.—Consent has been received to borrow £159,438 for providing additional electricity supplies for industrial purposes at Crompton and Royton.

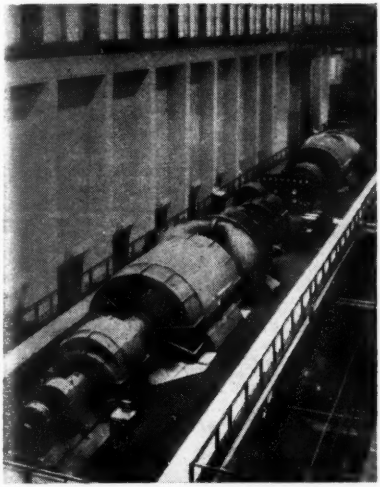
Overseas

Cyprus.—£3,000,000 ELECTRICITY PLAN.—It is reported that the Colonial Office has approved in principle plans for the establishment of a central power station and grid system costing between £2,000,000 and £3,000,000. A company is to be formed, financed chiefly by Cyprus capital. The project will take about two years to complete.—*Reuter.*

Progress in Manufacture—I

Noteworthy Orders and Achievements in 1946

SPEEDING up of power station construction with the termination of the war has brought orders for approximately 600,000 kW of generating plant to **C. A. Parsons & Co., Ltd.** Those being built include 60,000-kW sets for North Tees (North-Eastern E.S. Co.) and Leeds and



Two 53,500-kW Parsons turbo-alternators installed in Hams Hall "B" power station, Birmingham

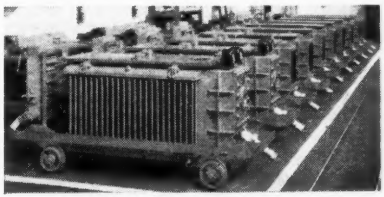
50,000-kW sets for Dunston (North Eastern Co.), Rotherham, Birmingham and Glasgow; all are of the three-cylinder type with double-flow low-pressure cylinder and will run at 3,000 r.p.m. Other orders include a third 40,000-kW set for Congella (South Africa) and sets of 30,000 kW or over for Brisbane and Newport "A" and "C" stations (Australia), Mulajore (India), Ballylumford (Northern Ireland) and Edmonton (Canada); the turbines have two cylinders in tandem, the l.p. one being double-flow, and the alternators except the Edmonton machine will be wound for 33 kV. A number of smaller sets are to be supplied to undertakings in Australia, Canada, Iraq and China and one of 20,000 kW to the Malay Peninsula.

Two 12,500-kW back-pressure and four 15,000-kW condensing (all single-cylinder) units have been ordered for an Indian sulphate of ammonia plant with initial steam conditions of 600 lb per sq in. and 825 deg F. The back-pressure turbines will exhaust at 25 lb per sq in. and steam will be extracted at 138 lb per sq in. (gauge) at full load. Extraction from the condensing turbines at full load will be at 120 and 40 lb. During the year the third 53,500-kW turbo-alternator at Hams Hall "B" station (Birmingham), the second 40,000-kW set at Earley (Reading) and a similar one at Congella (South Africa) and one of 20,000 kW in Calcutta were set to work.

The machinery for the 10,000-ton turbo-electric vessel *Beavercove* is nearing completion and her three sister ships have made their maiden voyages within the last year.

Orders received for transformers were up on any previous year by about 50 per cent, one-third being for export, mainly to South Africa and Russia. One in the latter group is a self-cooled 15-MVA, 120/10·5-kV, three-phase unit insulated for 242 kV with off-load taps on the higher-voltage winding. Two 58·5-MVA and two 36-MVA transformers for Dunston and North Tees power stations, four of 18 MVA for Bristol Corporation and two for the Central Electricity Board at Scarborough are representative of other orders in hand.

An indication of developments in the area of the North of Scotland Hydro-Electric Board is provided by the order placed with **Bruce Peebles & Co., Ltd.,** last year for two 10,000-kW, 500-r.p.m., 11-kV vertical-shaft



Group of Bruce Peebles mobile oil-immersed rectifiers for charging batteries on mine electric cars underground

alternators coupled to Francis turbines (head 500 ft), together with all auxiliaries, for Loch Fannich (Ross-shire) power station and for two 300-kW vertical-shaft alternators

driven by Kaplan turbines (head 16 ft) for Loch Morar station (Inverness) as well as for a number of service alternators. Many of the alternators now being made have integral water-cooled air filters and a considerable proportion, with outputs up to 3,750 kW, are for the Dominions.

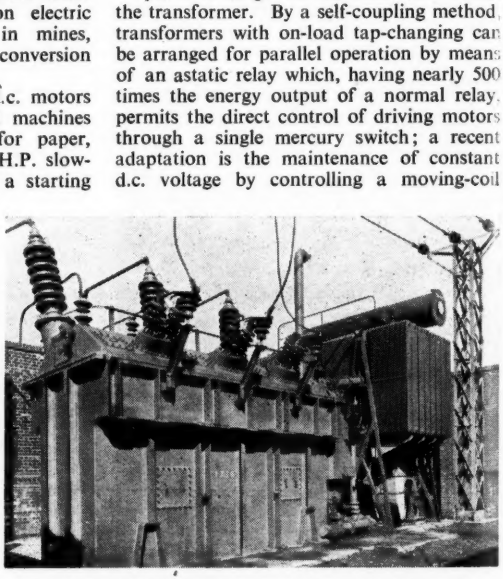
Six 1,500-kW motor-convertors and one 1,000-kW rotary for India and a large number of rectifiers, including a mobile oil-immersed model for charging batteries on electric cars for underground service in mines, provide examples of a.c./d.c. conversion plant in hand.

Heavy demands for a.c. and d.c. motors with control gear have included machines for shipping and mining and for paper, textile and flour mills; two 900-H.P. slow-speed induction motors exerting a starting power of 2,000 H.P. for driving tube mills in an Australian cement works and two 700-H.P. synchronous-induction motors for driving compressors at a West African gold mine are among the large number contracted for by overseas buyers.

Many of the motors embody a new design of rotor for direct-on-line switching, the bars of which are secured positively in the slots in order to avoid vibration and noise and to secure axial anchorage of the complete cage. Some 750,000 kVA of transformers were on order or completed last year for all standard outputs up to 75,000 kVA, three-phase (33/13·5 kV) and up to 132 kV; included in this total were distribution transformers for Sweden up to 30,000 kVA.

Although not the transformers of greatest output built by **Ferranti, Ltd.,** a notable achievement of this company last year was the manufacture of four 65,000-kVA, 240/110-kV ON/OFB units for Finland—reported to be the first three-phase transformers of 200-kV or over to be made in this country. Other large transformers under construction or on order include units of 70,000 kVA, 122/33/12 kV, for Hams Hall "B" power station (Birmingham), 30,000 kVA, 110 kV, for New Zealand, 28,000 kVA, 88/13·2/6·6 kV, for South Africa (two), and 54,000 kVA, 34/11·8 kV, for Ipswich (four). In addition 60,000- and 45,000-kVA, 132-kV units were taken over for the grid, on which there are now more than forty of 45,000 kVA or over from Ferranti's including the largest three-phase unit installed, 75,000 kVA.

The stress-control method of design has been extended both ways—to small distribution transformers having cross-over control windings and to high-voltage fully-insulated windings for operation with Petersen coils. Moving-coil voltage regulators are now being applied to on-load tap-changing gear with a 15 per cent range and self-contained within the transformer. By a self-coupling method, transformers with on-load tap-changing can be arranged for parallel operation by means of an astatic relay which, having nearly 500 times the energy output of a normal relay, permits the direct control of driving motors through a single mercury switch; a recent adaptation is the maintenance of constant d.c. voltage by controlling a moving-coil regulator on the a.c. side of rectifiers. The relay also figures in new designs of contactor on-load tap-changing gear, which now covers a range of 1,000 to 5,000 kVA.



Ferranti 60,000-kVA transformer recently installed on 132-kV grid system, with 20 per cent on-load tap-changing gear

Numerous radio-frequency heating equipments have been made for soldering, brazing and surface hardening and for pre-heating synthetic moulding pre-forms. Automatic equipment with a heating chamber taking electrodes up to 24 in. by 20 in. is available for the last-mentioned purpose. Electronic principles are also being applied to the magnetization of large permanent magnets, in which 200,000 ampere-turns of excitation are obtained.

A surge generator for 1,200 MV, supplied for testing cables under lightning-surge conditions, provides for 200-kV d.c. from rectifiers with a modified voltage-doubler circuit to give 400 MV with one end earthed.

Capital Expenditure from Revenue

General Consent Restored

IN 1927 the Electricity Commissioners issued a general consent to the use of net surplus revenue by local authority electricity undertakings for capital purposes. This was withdrawn during the war and specific applications for consent had to be made. The Commissioners have now decided to restore the general consent subject to certain conditions, the general principle being that expenditure of this type should be related to regularly recurring ordinary distribution works and comparatively short-lived assets.

The consent does not apply to generating plant or other works chargeable to generation capital account, land, buildings (including showrooms and substations, but not including substation kiosks), and h.v. mains and ancillary switchgear, transformers and equipment. For these purposes specific application for consent must be made.

The general consent is operative only in respect of expenditure incurred during the year in which the net surplus has been secured or the following year. Works carried out must be suitable for ultimate use, without further expense, on the standard system of supply, and undertakings are not absolved from compliance with the building control regulations.

Employment in November

EMPLOYMENT statistics for November are published in the *Ministry of Labour Gazette* for January. These show that the total number of insured people employed in industry and commerce in Great Britain was 12,016,900 of whom 4,042,200 were women. The figures exclude agriculture, mining and quarrying (other than coal mining), national and local government service, railways, shipping, fishing, dock and harbour service, and professional service. At mid-1939 the total was 12,331,200 (3,676,900) women, and at mid-1945, 10,935,600 (4,475,200 women).

In the various branches of the electrical industry (excluding electricity supply which is bracketed with gas and water), the numbers employed are shown in the accompanying table.

Figures relating to unemployment include the following:—Electrical engineering, 2,263 (662 women); electrical wiring and contracting industry 1,046 (70 women); and apparatus, cables, lamps, etc., 3,180, (1,322 women).

EMPLOYMENT DURING NOVEMBER (THOUSANDS)

Branch	Males (14-65)			Females (14-60)			Total		
	Mid-1939	Mid-1945	Nov., 1946	Mid-1939	Mi-d 1945	Nov., 1946	Mid-1939	Mid-1945	Nov., 1946
Electrical engineering ..	105·9	106·1	106·8	28·0	69·7	53·3	133·9	175·8	160·1
Electrical wiring and contracting	38·9	32·0	49·5	2·8	5·5	5·4	41·7	37·5	54·9
Electrical apparatus, cables, lamps, etc.	116·4	112·2	132·6	79·5	167·7	132·9	195·9	279·9	265·5

South Wales Steel Industry

Modernization and Development Plans

SPEAKING at the Port Talbot and Aberavon Chamber of Trade on February 6th, Mr. E. H. Lever, chairman of Richard Thomas & Baldwins, gave some details of the scheme for completing the modernization of the South Wales sheet and tinplate industry, the first stage of which began a decade ago at Ebbw Vale. He said that the various concerns affected had reached agreement upon the technical, administrative and legal structure, and the scheme had been approved by the Iron and Steel Federation. It was now awaiting the decision of the Steel Board. With the co-operation of the directors of Guest, Keen & Baldwins, Guest, Keen & Nettlefolds, Llanelly Associated Tin Plate Companies, and John Lysaght, Ltd., he had embarked on the task of forming the Steel Company of Wales, a new company which would have the responsibility of planning, erecting and managing the new hot strip and cold reduction plants and of selling their products.

The new company would take over most of the old type tinplate works owned by Richard Thomas & Baldwins and Llanelly Associated Tinplate Companies and the sheet works at Newport of John Lysaght, Ltd. The Port Talbot and Margan Works, at present owned by Guest Keen Baldwins Iron & Steel Co., would also be acquired and at Margan it was proposed to erect a continuous hot strip mill. The cold reduction mills would be constructed at Llangyfelach in the Swansea district and at Trostre in the Llanelly area. The site of the third cold reduction mill was under consideration.

The output of the Port Talbot and Margan coke ovens and blast furnaces would be doubled, the ingot production of those works would be trebled as a result of the erection of the new melting shop at Margan, and the hot strip mill would have an output of 20,000 tons a week. It was proposed that the hot strip mill should roll a coil weighing 15,000 lb, which was a larger coil than was at present rolled anywhere in the world. The horse-power necessary for driving the mill (46,000) would be greater than hitherto employed, even in America.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Thomas De La Rue & Co., Ltd.—At an extraordinary general meeting held last week resolutions with regard to the conversion of the present £1 shares into stock transferable in 5s. units, and making arrangements for the raising of new capital, were unanimously approved. Mr. B. C. Westall (chairman) said the board had decided that it was desirable to raise £500,000 in preference shares and to issue 116,000 ordinary shares at a price which remained to be determined. Subject to the consent of the Capital Issues Committee being obtained, this would provide approximately £1,500,000. This did not represent the whole of the company's requirements; something approaching £1,000,000 more would be needed. Negotiations for the sale of the Plastic Moulding Section (De La Rue Plastics, Ltd.) had reached an advanced stage and this transaction, with the new capital, would provide the additional capital required for the expansion of De La Rue Insulation, Ltd., and De La Rue Gas Development, Ltd.

The Victoria Falls and Transvaal Power Co., Ltd.—On February 5th it was announced in the House of Assembly of the Union of South Africa, that the Government had decided that steps should be taken, under legislation dealing with the expropriation of an electricity undertaking, with regard to the Victoria Falls & Transvaal Power Co. It is therefore anticipated by the board of the company that two years' notice of the intention to expropriate the undertaking will be given at the end of 1948.

New Companies

Sir Robert Watson-Watt & Partners, Ltd.—Registered January 29th. Capital, £20,000. To adopt an agreement with Sir Robert A. Watson-Watt, and to act as consultants and advisers on scientific research and development policy in all its branches; to carry on the business of consulting, electrical, radio, radar, mechanical and general engineers, etc. Sir Robert A. Watson-Watt is governing director. Solicitors: Frere Cholmeley & Co., 28, Lincoln's Inn Fields, W.C.2.

Electrical Appliances & Accessories, Ltd.—Registered January 31st. Capital, £1,000. Manufacturers of, and dealers in, wireless transmitting and receiving sets, television sets, electrical goods and appliances, etc. Subscribers: H. S. Eyers and S. C. Ricketts. Solicitors: Kennedy & Co., 55, Queen Anne Street, W.1.

F. D. Powers, Ltd.—Registered January 29th. Capital, £4,000. Manufacturers of, and dealers in, wireless and electrical components, etc. Directors: F. D. Powers and Mrs. Martha Powers. Regd. office: 7, Princes Parade, Potters Bar, Middlesex.

Ford Wholesale Electric, Ltd.—Registered January 31st. Capital, £10,000. Manufacturers of, and dealers in, electrical goods and apparatus, etc. Directors: L. G. Ford, C. L. Ford, E. W. Ford and F. G. Wiseman. Regd. office: 6, St. Leonards Road, Eastbourne.

Kolectric, Ltd.—Registered January 30th. Capital, £100. Manufacturers of, and dealers in, electrical and scientific apparatus, appliances and equipment, etc. Subscribers: C. R. Webb and J. Wynne. Regd. office: 49, Bedford Row, W.C.1.

Fishers (Norwich), Ltd.—Registered January 28th. Capital, £10,000. Electrical engineers and general electrical installation contractors, wireless engineers, etc. C. C. Fisher is the first director. Regd. office: 27, St. Andrew Street, Norwich.

F. J. Field, Ltd.—Registered January 28th. Capital, £5,000. To acquire the business of an electrical contractor carried on by F. J. Field at 50, Sydney Road, Muswell Hill. Directors: H. D. Simmonds, J. Palmer and R. F. Sutton. Regd. office: 21, Liverpool Street, E.C.2.

E. Hosey & Co., Ltd.—Registered January 25th. Capital, £2,000. Electrical installation contractors and engineers, radio and television engineers, etc. Directors: E. Hosey and Mrs. Mary A. Hosey. Regd. office: 16/18, Hackins Hey, Dale Street, Liverpool.

C. Hossle, Ltd.—Registered January 27th. Capital, £1,000. Electrical contractors, electric wiring and installation specialists, etc. Subscribers: C. Hossle and D. G. Hossle. Secretary: W. H. French. Regd. office: 3, Sandgate Road, Folkestone.

"Polax" Co., Ltd.—Registered January 23rd. Capital, £1,500. Manufacturers of, and dealers in, electric washing machines, etc. Directors: J. M. Togerson and Mrs. Margaret Togerson. Regd. office: East Forest Hall Road, Forest Hall, Newcastle-on-Tyne.

Liquidations

United Electronics, Ltd.—Winding up voluntarily. Liquidator, Mr. P. Philips, 76, New Cavendish Street, London, W.1.

Star Electro Carbons, Ltd.—Winding up voluntarily. Liquidator, Mr. T. Jones, 31, Church Street, Enfield. Particulars of claims to the liquidator by February 28th.

Tipton Electrical Repairs, Ltd.—Winding up voluntarily. Liquidator, Mr. C. W. George, 7, Priory Street, Dudley.

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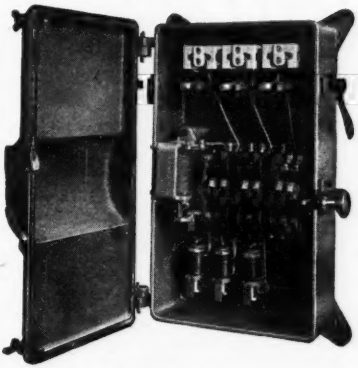

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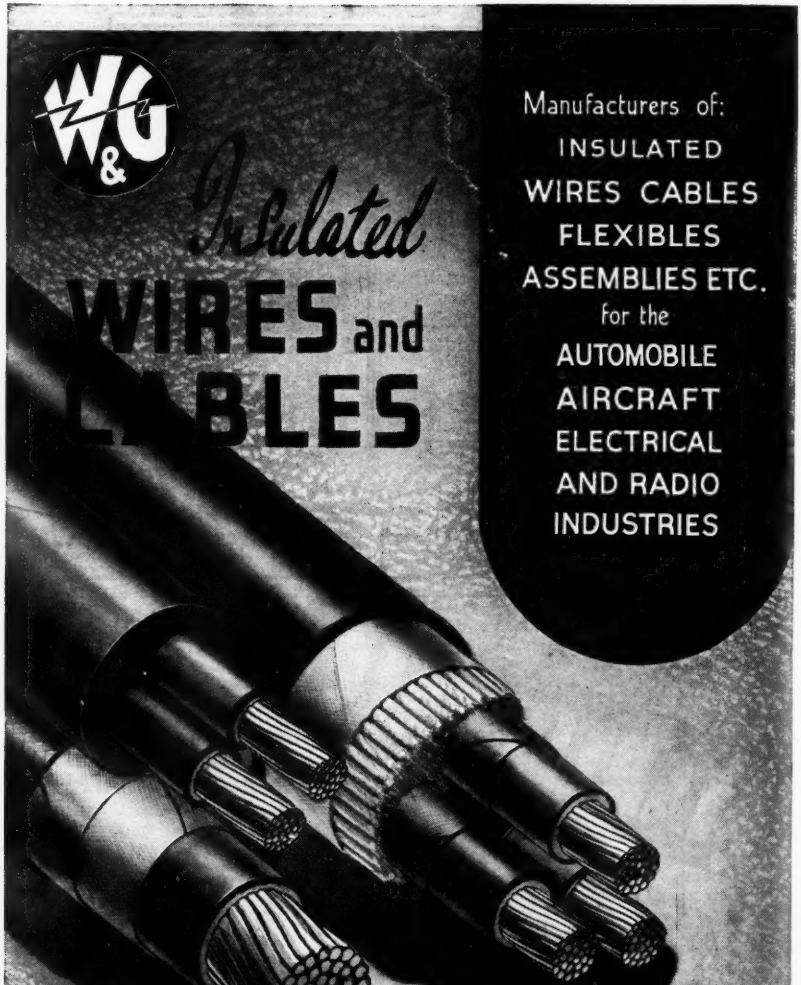
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STOCKS AND SHARES

THE Stock Exchange markets have been, and still are, in a state of considerable uncertainty. The gravity of the coal situation and the effects of the deplorable weather have proved too much for the resistance hitherto offered by the majority of industrial ordinary shares. No particular fall has occurred, but the disposition in most departments has been for prices to droop as the sellers got the upper hand. The influence of the Electricity Bill has been comparatively slight up to the present, and the transport debate failed to act in any way unfavourably upon Home Railway stocks. New capital issues are being poured out day by day. Most of them find a ready home, but the beginning of the market in the shares sometimes leads to disillusion for applicants who had "stagged" the issues in order to snatch a quick profit.

Electricity Supply Shares

Prices of the shares most concerned with the Electricity Bill showed indifference to the course of the Parliamentary debate and have remained, generally speaking, within a florin or so of the prices estimated for compensation purposes. Thus, compared with the take-over prices, County of Londons are quoted at 47s., against 49s. 5d.; Edmundsons at 30s., against 31s. 6d., and Midland Counties Electric at 49s., against 51s. 5d.

The recent spread of uneasiness through the industrial markets has served to check the inclination to anticipate prospective loss of income in electricity shares, by reinvesting elsewhere at this stage. Shareholders are evidently becoming more thoughtful over the probability of better opportunities presenting themselves before the take-over. Possibly they observe the attraction of having both capital and income protected, for the time being, by the terms of the Bill.

Dividends and Compensation

Shareholders in most of the leading electricity undertakings have watched their companies double and treble their output over the last dozen years, with plant bought by surplus profits that justifiably might have been distributed in dividends. Stability has been the characteristic of electricity dividends, which have been kept down to very modest proportions in relation even to nominal capital, the latter being, in most cases, small compared with the capital actually employed.

De La Rue

De la Rue ordinary shares rose to 15 on buying largely in small quantities, suggestive of a desire on the part of purchasers to get their names on the company's register before the £1 shares are split into new 5s. shares, and the fresh capital is offered in preference and ordinary stocks. The company is developing rapidly, and at the meeting last week reference was made to a pair of subsidiaries that are to be formed from the old company.

Coal and Prices

Curtailment or stoppage of work, as a consequence of the coal shortage, lays restraint upon investment purchases. It causes sales by holders who anticipate shrinkage of profits, and possible reduction in dividends. Falls predominate in the prices of manufacturing and equipment companies. Tube Investments at 6 11/16 are 7s. 6d. down on the week. Johnson & Phillips at 80s., show a loss of 3s. 6d., and Metal Industries "B" at 61s. 3d., are 2s. 6d. down. General Electrics have gone back to £5, Enfield Cables to 51s. 6d., English Electrics to 63s., and Siemens to 37s. 6d. Brush went against the trend with a rise from 7s. 9d. to 8s. 6d., under the influence of the recent developments. Westinghouse Brakes lost another 1s., to 75s. In the radio group, E. K. Cole have declined to 30s. 9d., Cossor to 29s. 9d., Decca to 53s. 9d. Others show smaller losses.

Home Railway prior charge stocks keep firm; Southern 5 per cent preference is 2 points up at 122½. The London Midland & Scottish dividend of 2¾ per cent, against 4 per cent a year ago, failed to realize expectation.

Victoria Falls & Transvaal

Victoria Falls & Transvaal Power ordinary shares have gone back to 5½, a fall of 5s. on the week. This was due to an announcement in the South African House of Assembly, last week, making it practically assured that the South African Government intends to take advantage of its option to expropriate the undertaking in two years from the end of 1948. It is assumed that the preference will be paid off at 20s., the par value, and from 27s., the price has fallen to 23s. The drop in the ordinary shares may appear excessive, but anything in the nature of nationalization arouses apprehension nowadays.

Telegraph Construction

A recent feature of the electrical equipment market has been the steady advance in the price of the £1 shares of Telegraph Construction & Maintenance, the cable manufacturers. From 56s. 3d., the shares have moved up to 61s., after touching 62s., in a month during which the general run of prices has been, if anything, the other way. The financial year ended in December, and the final dividend is due in March. Last year's report caused some consternation with the disclosure of a trading profit less than half the previous figure, although the net profit actually showed an increase after much lower tax provisions. Dividends of 10 per cent have been paid without a break since 1937. Eighteen months ago the capital was raised to £682,000 by the issue of 227,000 new shares at 50s. For 1946 the interim was maintained at 5 per cent. The shares are on a yield basis of 3¼ per cent.

Forthcoming Events

Friday, February 14th. — LONDON. — St, Stephen's Tavern, Bridge Street, Westminster. 6.30 p.m. E.P.E.A. Meter Engineers' Group (Southern Division). Open discussion.

Monday, February 17th.—LIVERPOOL.—Royal Institution, Colquitt Street, 6 p.m. I.E.E. Mersey and North Wales Centre. "The Development and Design of Colonial Telecommunication Systems and Plant," and "The General Planning and Organization of Colonial Telecommunication Systems," by C. Lawton and V. H. Winson.

NEWCASTLE-ON-TYNE.—King's College, 6 p.m. I.E.E. North-Eastern Centre (Radio and Measurements Group). Annual general meeting.

BRISTOL.—Victoria Rooms, 6.30 for 7 p.m. I.E.E. Western Centre. Dinner-dance.

BIRMINGHAM.—Grand Hotel. Birmingham Electric Club. "Maximum Demand Limitation," by A. H. Gray.

BRADFORD.—Technical College, 7.15 p.m. Bradford Engineering Society. "Electrical Driving for Textile Machinery," by A. J. Francis.

Tuesday, February 18th.—LONDON.—I.E.E. London Students' Section, 7 p.m. Discussion on "Radio Modulation Methods—Amplitude, Phase, Frequency and Pulse," opened by G. Dawson, D. Deacon and R. F. Howard.

MANCHESTER.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre (Measurements Group). "A Millisecond Chronoscope," by R. S. J. Spilsbury and A. Felton, and "A Sensitive Recording Magnetometer," by A. Butterworth.

GLASGOW.—University. Institute of Physics (Scottish Branch). "Dielectric Heating," by A. J. Maddock.

Wednesday, February 19th. — LONDON. — Institution of Electrical Engineers (Radio Section), 5.30 p.m. "Design of High-Fidelity Disc-Recording Equipment," by H. Davies.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "The Electrical Equipment of a Modern Hospital," by J. Tomlinson.

Connaught Rooms, Great Queen Street, W.C.2, 12.45 for 1.15 p.m. British Refrigeration Association. Annual luncheon.

NEWCASTLE-ON-TYNE.—Literary and Philosophical Society, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture. "The Generation and Wholesale Distribution of Electricity," by J. Hacking.

SHEFFIELD.—Royal Victoria Station Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. "Electrical Control of Dangerous Machinery and Processes," by W. Fordham Cooper.

GLASGOW.—Grosvenor Restaurant, 6.30 p.m. I.E.E. Scottish Centre. Dinner-dance.

WORCESTER.—Electricity Works Recreation Room, Hylton Road, 7 p.m. Electrical Power Engineers' Association (Midland Technical Group). "Television," by L. L. Ruderman.

Thursday, February 20th. — LONDON. — Institution of Electrical Engineers, 5.30 p.m. "Neutral Earthing of Three-Phase Systems, with particular reference to Large Power Stations," by J. R. Mortlock and C. M. Dobson.

EXETER.—Royal Clarence Hotel, Cathedral Yard, 3 p.m. I.E.E. Devon and Cornwall Sub-Centre. "Fundamental Legislation for Electricity Supply to Consumers," by W. Fennell.

SWANSEA.—Guildhall, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "The Influence of Resistance Switching on the Design of High-Voltage Oil Circuit-Breakers," by H. E. Cox and T. W. Wilcox.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "The Telecommunication Services at a Modern Civil Airport," by G. Enright.

PENGAM.—Association of Mining Electrical and Mechanical Engineers (South Wales Branch), 6 p.m. "Some Aspects of Colliery Lighting," by E. N. Lockyer.

Friday, February 21st.—LONDON.—Connaught Rooms, Great Queen Street, W.C.2. Electrical Trades Commercial Travellers' Association. Luncheon.

Institution of Electrical Engineers (Measurements Section), 5.30 p.m. "Quantitative Tests on Finished Mouldings," by W. D. Owen.

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. "Light and Colour," by L. H. A. Carr.

GLASGOW.—Royal Technical College, 7 p.m. Society of Instrument Technology (Scottish Section). "Electrical Measuring Instruments," by M. H. Arnold.

Saturday, February 22nd.—MANCHESTER.—Engineers' Club, Albert Square, 2.30 p.m. I.E.E. North-Western Students' Section. "Trends in Telecommunication," by A. H. Mumford.

Monday, February 24th.—LONDON.—Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Hot-Cathode and Cold-Cathode Discharge Tube Lighting," opened by Prof. H. M. Barlow.

BIRMINGHAM.—James Watt Memorial Institute, 4 p.m. I.E.E. South Midland Centre (Radio Group). "Tendencies in Design of Communications-Type Receivers," by G. L. Grisdale and R. B. Armstrong.

RUGBY.— Corporation Electricity Showrooms, 6.45 p.m. I.E.E. Rugby Sub-Centre. "The Teaching of the Principles of Electrical Machine Design," by L. H. A. Carr.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre (Installations Group). Informal discussion on "Steel Works Electrification."

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

AUSTIN Motor Co., Ltd., J. P. Blundell and F. W. Rowlands.—" Electrically heating bars of iron or the like, by passage of current therethrough." 25320. December 18th, 1944. (584771.)

Automatic Telephone & Electric Co., Ltd.—" Telephone conversion recording equipment." 16211/44. November 5th, 1943. (584754.)

Automatic Telephone & Electric Co., Ltd., C. E. Beale and H. E. Hopley.—" Telephone systems." 8492. May 5th, 1944. (584677.) " Telephone systems," 14112/46. May 5th, 1944. (Divided out of 584677.) (584725.)

C. J. Banwell.—"Electrical testing apparatus." 26189. December 30th, 1944. (584776.)

J. R. Bateman.—" Control of electric spot welders." 9704. May 19th, 1944. (584937.)

Belling & Lee, Ltd., and C. W. Heath.—" Electrical socket connectors or holders for multi-pin valves or other components." 2585. February 1st, 1945. (584884.)

Bendix Aviation Corporation.—" Groups of electrical transformers." 15175/44. June 12th, 1943. (584861.)

Benjamin Electric, Ltd., and G. Herbert.—" Galleries or shade holders of lighting fittings." 1808. January 23rd, 1945. (584715.)

British Thomson-Houston Co., Ltd.—" Insulated electrical conductors." 1827/45. January 26th, 1944. (584716.) " High frequency electronic devices." 4678/43. March 28th, 1942. (584787.) " Magnetic induction electron accelerators." 17139/44. September 10th, 1943. (584810.) " Washing apparatus." 2069/45. January 27th, 1944. (584827.) " Electric discharge lamp bases and starters." 2335/43. February 14th, 1942. (584913.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" Gas turbines." 2369. January 30th, 1945. (584873.)

British Thomson-Houston Co., Ltd., and C. F. M. Hurd.—" Electric lampholders with moisture proof enclosures." 1931. January 24th, 1945. (584720.)

British Thomson-Houston Co., Ltd., and A. H. Maggs.—" Variable speed polyphase motors." 2120. January 26th, 1945. (584831.)

Brush Electrical Engineering Co., Ltd., and C. B. M. Dale.—" Two stroke internal-combustion engines of the opposed piston type." 18043. July 14th, 1945. (584783.)

W. A. S. Butement and A. J. H. Oxford.—" Electrical signalling systems." 17308. December 4th, 1942. (584729.)

Callender's Cable & Construction Co., Ltd., and G. M. Hamilton.—" Manufacture of rubber in cellular form." 14989. October 8th, 1940. (584906.)

Callender's Cable & Construction Co., Ltd., L. G. Brazier and D. T. Hollingsworth.—" Couplings for cables." 18153. December 21st, 1942. (584912.)

Callender's Cable & Construction Co., Ltd., G. M. Hamilton and L. G. Brazier.—" Manufacture of rubber in cellular form." 8102. June 27th, 1941. (584908.)

J. Collard.—" Apparatus for measuring high-frequency electric field intensity." 12620. September 5th, 1942. (584668.)

S. Coulson.—" Method of and apparatus for electro-plating cylinders." 7591. April 24th, 1944. (584675.)

J. A. Crabtree & Co., Ltd., W. E. Hill and B. Stokes.—" Electric switches having oil-immersed contacts." Cognate applications 2200/45 and 20642/45. January 29th, 1945. (584834.) " Starting switches for electric motors." 2490. January 31st, 1943. (584880.)

F. W. Cutts.—" Electric circuit arrangements such as are employed as switching devices for the generation of electrical waveforms and for other purposes." 6421. April 6th, 1944. (584740.)

Decca Radio & Television, Ltd., H. F. Schwarz, and W. J. O'Brien.—" Radio control systems for movable objects." 7092. June 4th, 1941. (584727.)

Enfield Rolling Mills, Ltd., and P. B. Crossley.—" Sealing of metals to vitrified materials such as glass, silica, porcelain and the like." 8472. May 4th, 1944. (584935.)

English Electric Co., Ltd., and J. E. Salthouse.—" Electric arc-welding apparatus." 17789. September 18th, 1944. (584695.)

Ferranti, Ltd., A. L. Chilcot and W. Birtwistle.—" Hermetically-sealed electrical devices such as condensers." 15427. August 12th, 1944. (584862.)

Ferranti, Ltd., W. R. J. Mayes and E. J. Whitmore.—" Velocity-modulated electron-discharge devices." 12148. June 26th, 1944. (584944.)

T. H. Flowers.—" Electronic valve apparatus suitable for use in counting electrical impulses." 22912. November 17th, 1944. (584704.)

General Electric Co., Ltd., and C. J. O. Garrard.—" Controlling apparatus for electric motors." 9419. June 11th, 1943. (584915.)

General Electric Co , Ltd., S. H. Dale and E. R. Hickling.—" Remote control of electric motors, more especially traction motors." 11789. August 21st, 1942. (584847.)

General Motors Corporation.—" Insulator compound for electric cables and the like." 2174/45. January 29th, 1944. (584832.)

Ges. zur Forderung der Forschung auf dem

Gebiete der Technischen Physik an der Eidgenossischen Technischen Hochschule.—" Television receiving apparatus." 17454/43. January 25th, 1943. (584916.)

G. N. Haden & Sons, Ltd., and H. H. Bruce.—" Domestic water heating apparatus." 144. January 2nd, 1945. (584711.)

W. T. Henley's Telegraph Works Co., Ltd., and E. Moor.—" Containers for housing electric connectors of the kind known as line taps." 2903. February 5th, 1945. (584901) " Electric plug connectors fitted with fuses." 2904. February 5th, 1945. (584902.)

Hoover, Ltd.—" Suction cleaners." Cognate applications 2010/45 and 2011/45. January 28th, 1944. (584825.) " Suction cleaners." 2098/45. March 25th, 1944. (584830.)

Hoover, Ltd., and W. J. T. Dimmock.—" Commutators particularly for dynamo-electric machines." 17673. September 15th, 1944. (584867.)

Imperial Chemical Industries, Ltd.—" Electro deposition of zinc." 1573/45. January 19th, 1944. (584822.)

Irving & Kingsbury, Ltd., M. M. O. Irving and H. E. R. Kingsbury.—" Socket members of bayonet-type electrical connectors." Cognate applications 2759/45 and 21397/45. February 3rd, 1945. (584895.)

J. Lawton and A, C. Lynch.—" Frequency stabilized thermionic valve oscillator." 3039. February 18th, 1944. (584673.)

London Passenger Transport Board and A. F. Collins.—" Electric lampholders for double ended lamps." 2632. February 2nd, 1945. (584887.)

J. Lucas, Ltd., and H. H. Foxall.—" Electric push-pull switches." 21728. November 6th, 1944. (584764.)

J. Lucas, Ltd., and G. D. Spender.—" Electrical battery connections." 17865. July 12th, 1945. (584723.)

Marconi's Wireless Telegraph Co., Ltd.—" Low-pass network." 23737/44. November 29th, 1943. (584769.)

Marconi's Wireless Telegraph Co., Ltd., N. M. Rust, G. E. Partington, D. L. Plaistowe and D. J. Fewings.—" Electrical oscillation generators." 1480. February 4th, 1941. February 4th, 1941. (584726.)

Maschinenfabrik Oerlikon.—" Gas-blast circuit breakers." 1838/45. January 24th, 1944. (584717.) " Automatic synchronizing apparatus for alternating-current circuits." Cognate applications 14692/44 and 14693/44. August 2nd, 1943. (584951.)

Metropolitan-Vickers Electrical Co., Ltd., and D. R. Davies.—" Voltage transformers." 25414. December 18th, 1944. (584818.)

Metropolitan-Vickers Electrical Co., Ltd., H. Maxwell and W. Howard.—" Thermally-operable electric switches or relays." 2570. February 1st, 1945. (584883.)

H. E. Moore.—" Synchronous electric motors." 19954. October 16th, 1944. (584762.)

M-O Valve Co., Ltd., A. W. W. Gait and C. W. Tapping.—" Manufacture of indirectly heated cathodes for electric discharge devices." Cognate applications 2968/42 and 9518/42. March 6th, 1942. (584910.)

Partridge, Wilson & Co., Ltd., and F. G. Sawyer.—" Low voltage transformer units." 2242. January 29th, 1945. (584837.)

A. H. Reeves and F. C. Williams.—" Radio navigation systems." 16165. October 1st, 1943. (584670.) " Radio navigation systems." 2712/46. October 1st, 1943. (Divided out of 584670.) (584724.)

Revo Electric Co., Ltd., A. E. Felton and A. Crawford.—" Service boxes for electric current supply." 20016. October 17th, 1944. (584812.)

A. Reyrolle & Co., Ltd., and D. F. Amer.—" Gas-blast electric circuit-breakers." 1882. January 24th, 1945. (584718.)

A. Reyrolle & Co., Ltd., and J. Christie.—" Pneumatic operating mechanisms for electric switchgear." 2633. February 2nd, 1945. (584888.)

St. Helen's Cable & Rubber Co., Ltd., A. V. Swallow and A. J. Ensor.—" Extrusion machines for non-metallic plastic materials." 6755. April 12th, 1944. (584929.)

E. Schaefer.—" Electrical condensers having plastic film dielectrics." 714. January 14th, 1944. (584672.)

Siemens Bros., & Co., Ltd., and L. S. Crutch.—" Alternating current telegraph systems." 24670. December 8th, 1944. (584871.)

Soc. pour la Fabrication des Projecteurs Electriques Marchal.—" Light projectors." 23315/39. May 11th, 1939. (584666.)

Standard Telephones & Cables, Ltd.—" High-frequency electric coupling system." 18133/44. October 1st, 1943. (584696.)

Standard Telephones & Cables, Ltd., and W. A. Beatty.—" Electrical direction finding systems." 33056. December 29th, 1939. (584786.)

Standard Telephones & Cables, Ltd., and B. B. Jacobsen.—" Amplifiers of electromagnetic energy." 2607. February 11th, 1944. (584923.)

Standard Telephones & Cables, Ltd., B. B. Grace and E. Mills.—" Soldering or brazing processes." 7984. April 28th, 1944. (584934.)

P. A. Sporing and C. P. Johnson.—" Tubular containers for electrical condensers or other apparatus." 8680. May 8th, 1944. (584801.) " Tubular containers for electrical condensers or other apparatus." 13898. July 20th, 1944. (584807.)

Wall's, Ltd., and J. Bayliss.—" Electrically heated hot-plates." 22987. November 20th, 1944. (584817.)

Amended Specification

565689. Siemens Electric Lamps & Supplies, Ltd.—" Electrodes for electric discharge devices."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast.—February 21st. Electricity Department. Supply of various stores. (January 31st.)

March 7th. Electricity Department. (a) 6·6-kV armourclad switchgear and cabling for Harbour power station (Spec. G76); and (b) 33-kV, 6·6-kV and auxiliary cabling at step-down substations (Spec. G.77). (See this issue.)

Bletchley.—March 31st. U.D.C. Three sets of electrically driven vertical sewage pumps. John Taylor & Sons, Artillery House, Westminster, S.W.1.

Brechin (Angus).—Town Council. Electrical work at eighty houses. Schedules from Burgh Surveyor, 30, Panmure Street.

Cleethorpes.—March 3rd. Corporation. Electrical installations in 136 houses on the Clee Road site. (See this issue.)

Gainsborough. — March 1st. Electricity Department. Two 500-kVA three-phase transformers. (See this issue.)

Grimsby.—February 26th. Town Council. Engineering works in connection with extensions to the generating station at Moss Road. Borough electrical engineer, Moss Road.

Harrogate.—February 20th. Town Council. Wiring of 128 houses, Knaresborough Road estate. Borough engineer, Municipal Offices.

Heston & Isleworth.—February 26th. Electricity Department. Materials for the year ending March 31st, 1948. (February 7th.)

Irlam.—March 1st. Urban District Council. Electric lamps for one year from April 1st, 1947. Survevor, Council Offices.

Kent.—March 8th. County Council. Applications are invited from firms whose names are on the National Register of Electrical Installation Contractors for inclusion in the County Council's approved list of contractors for electrical engineering works. (See this issue.)

Kettering.—March 3rd. Electricity Department. Two 11,000-V, 3-phase, 50-cycle, 150,000-kVA switch units. (February 7th.)

Manchester.—February 22nd. Electricity Committee. 110-V and 50-V batteries and charging equipments at substations. (January 31st.)

February 24th. Electricity Department. Electric cookers for twelve months ending March 31st, 1948. (February 7th.)

Mitcham. — March 5th. Town Council. Electrical goods for the year from April 1st. Borough engineer, Town Hall.

New Mills.—February 28th. U.D.C. Electricity Department. Transformers. (January 31st.)

Norfolk.—February 21st. County Council. Electrical services in connection with conversion of Drayton Hall, near Norwich to a maternity home. C. H. Thurston, county architect, 25, Thorpe Road, Norwich.

Sheffield.—March 3rd. Electricity Department. One 55-MVA, 33-kV oil-immersed copper-shielded reactor. (February 7th.)

March 16th. Three 1,000-kVA, 11,200/3,000-V transformers. (February 7th.)

Southampton.—February 21st. Electricity Department. P.i. insulated cables, stores and materials, domestic apparatus and electricity meters during the year ending March 31st, 1948. (February 7th.)

Southend-on-Sea.—March 10th. Electricity Department. Private automatic branch telephone exchange. (February 7th.)

West Riding.—February 22nd. County Council. Re-wiring Middleton-in-Wharfedale Sanatorium. County architect, County Hall, Wakefield.

Winchester.—March 8th. City Council. Thirty steel lighting columns and one wall bracket, complete with fittings, for mercury vapour discharge lighting. (February 7th.)

Woolwich.—March 1st. Electricity Department. Switchgear and switch kiosks. (February 7th.)

Orders Placed

Glasgow.—Corporation Housing Committee. Accepted. Electrical installation at fifty-four houses at Balornock and Robroyston.—G. T. Scott.

Hammersmith.—Electricity Committee. Accepted. Switchgear for generating station (£6,710).—Ferguson, Pailin. Switchgear for Down Place substation (£2,613).—J. G. Statter.

Ilford.—Electricity Committee. Accepted. Switchgear (£14,116).—A. Reyrolle & Co.

London.—Metropolitan Water Board. Accepted. Wiring and lighting at Battersea works (£4,045).—Carlin Engineering Co.

Northumberland. — Education Committee. Accepted. Electrical installation at Amble County School (£1,279).—I. & E. Morton.

St. Marylebone.—Housing Committee. Accepted. Barrow Hill housing scheme. Electrical installations and fittings (£8,636).—Matthew Hall & Co. Two lifts (£2,070).—Keighley Lifts.

Sheffield.—Electricity Committee. Accepted. Switchgear for Neepsend power station (£74,935).—Metropolitan-Vickers.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Schools at Cornhill (£259,567) and Cummings Park (£258,528); city architect.

Batley.—Houses (42), Halifax Road; T. Mossop, borough surveyor.

Bellingham (Northumberland).—Council school (£53,000); T. Muckle & Sons, Bridge Street, Rothbury via Morpeth.

Brechin.—New bakery, etc., Southesk Street (£12,500); Gellatlys Wholesale, Ltd.

Carlisle.—Two primary schools, Orton Road and Edentown; P. Dalton, city engineer.

Cheetham.—Factory, Derby Street and Stocks Street, for J. Smyllie, Ltd.; W. T. Gunson & Son, architects, 10, Marsden Street, Manchester, 2.

Chesterfield.—Houses (66), Whittington; A. F. White, builder, Derby Road.

Cockermouth.—Houses (196), for the North-Eastern Housing Association, Newcastle-on-Tyne; Couves & Partners, architects, Carliol House, Newcastle-on-Tyne.

Congleton.—Permanent houses (96), Wood Hill estate; borough surveyor, Town Hall.

Coventry.—Public laundry, Livingstone Road (£38,000); D. E. E. Gibson, city architect, 1a, Warwick Row.

Cumberland.—New schools at Brampton, Maryport, Kells, Keswick and Wigton (£630,000); county architect, 4, Alfred Street North, Carlisle.

Darlington.—" Lamella " type houses (100); borough engineer.

Dairy for Carrsides Dairy, Ltd., 95, North Road.

Dunfermline.—New X-ray wing for Dunfermline and West Fife Hospital; Muirhead & Rutherford, architects, Phœnix Lane.

East Grinstead.—Maisonettes (56), Halsford Park estate; S. A. Gregory, Ltd., Worthing.

East Lothian.—Houses (168); county architect, County Buildings, Haddington.

Edinburgh.—Hospital for the aged, Ingliston estate; F. Lorne, architect, 1 Montague Place, Bedford Square, London, W.C.1.

Eston (Yorks).—Houses (106) for the U.D.C.; surveyor.

Fishguard.—Houses (50), Penwallis site; surveyor, Urban Council Offices.

Gateshead.—Factory, Team Valley estate, for Northern Coachbuilders, Ltd.; Cackett, Burns Dick & Mackellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Jarrow.—Houses (150); H. W. T. Perkins, borough engineer.

Lerwick, Zetland.—Building for Herring Industry Board; Tawse & Allan, 343, Union Street, Aberdeen.

Manchester.—Improvements and extensions of hospitals (£158,000); city architect.

Middlesbrough.—Rebuilding of Middlesbrough Little Theatre (£10,000); J. Shewell, chairman, 200, High Street, Redcar.

Reconstruction and extension of the Lord Raglan Hotel for J. W. Cameron & Co., Ltd. (£30,000); Kitching & Co., architects, 21, Albert Road.

Pontypool.—Permanent houses (52), Kemys Fawr site, for U.D.C.; F. R. Bates & Son, architects, 78, Bridge Street, Newport, Mon.

Poole.—New factory for Northey Rotary Compressors, Ltd., St. Clements Road.

Salford. — Research laboratories, Lower Broughton Road, British Cotton & Wool Dyers' Association; Spencer & Clarke, Ltd., builders, Elton Saw Mills, Bury.

Seaham.—Pithead baths, Butcher Street; Miners' Welfare Commission.

Southwark.—Canteen and factory extension, 1-6 Queen's Row; P. C. Boddy, 19, Palace Street, S.W.1.

Stockton-on-Tees.—Factory for the Riley Clock & Instrument Co., Ltd.; W. Pearson & Son, builders, Stranton, West Hartlepool.

Sunderland.—Secondary school at Thorney Close (£122,000); education architect.

Swinton and Pendlebury.—Houses (42), Beach Farm, Swinton; borough surveyor, Town Hall.

Tow Law (Co. Durham).—Factory for George Blair, Ltd., engineers, etc.; G. Dougill & Sons, Chesnut Street, Darlington.

Tynemouth.—New junior department at Collingwood School; G. H. Gray, architect, 50, Camden Street, North Shields.

Additions to Ralph Gardner Secondary School (£64,000); G. H. Gray, architect, 50, Camden Street, North Shields.

Additions to Linskill Secondary School (£80,000); W. Stockdale, architect, 72, Howard Street, North Shields.

Wakefield.—Permanent houses and shops (900), Eastmoor; borough surveyor.

West Auckland (Co. Durham).—Five factories at West Auckland Trading Estate; E. G. Lediard, consulting engineer, 4, Eldon Square, Newcastle-on-Tyne.

West Hartlepool.—Two technical schools; borough architect.

Whitley Bay.—Factory near the Foxhunters' Inn for E. Spode, Ltd.

Willenhall.—Houses (50), Beacon Colliery estate, for U.D.C.; H. Lee Bros., Ltd., builders, 10, Thuree Road, Smethwick.

Wolverhampton.—Additions, Walsall Street, for Wolverhampton and Staffordshire Technical College (£12,000); W. M. Law, borough engineer, Town Hall.